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ABSTRACT

A study examined the experiences of some 1.4 million American defense industry workers, displaced in the wake of the Cold War, as a way of reviewing and evaluating national policies toward worker adjustment and re-employment as they have evolved in the 1990s. The study found that the federal government, through the Department of Labor, acknowledged responsibility for the unemployment resulting from the end of the Cold War and that new types of programs were needed for these displaced workers. However, results of the initiatives spawned by these policies were mixed. Key conclusions of the study include the following: (1) the federal government endorsed a radically "marketized" approach (supporting mergers, encouraging firms to seek foreign military markets rather than to diversify at home, and favoring short-term technological fixes) to labor resulting in workers bearing the brunt of the costs of post-Cold War downsizing as their employers continued to earn high profits; (2) programs geared toward re-employing displaced workers meet their goals when they dedicate brainpower and financial resources to matching and adapting existing employee skills to identifiable opportunities in local labor markets; (3) transition programs directed at businesses retain jobs when they encourage training-intensive (as opposed to technology-intensive) strategies; and (4) if they are to create jobs, federal investments in emerging technologies require not only the "push" of initial research and development expenditures, but also the large-scale market creation induced by government procurement policies. (Contains 119 references, 16 tables, 3 boxes, and 3 figures.) (KC)

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TECHNICAL PAPER

A Just Transition? Lessons from Defense Worker Adjustment in the 1990s

Laura Powers
Ann Markusen

April 1999

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Introduction 1

I. Defense Labor Dynamics: At the Nexus of Markets and Policy 6
Impacts of Defense Industrial Policy on Workers 10
1. Industry consolidation vs. market diversification 11
2. Continued military orientation of federal research 13
3. Support for Arms Exports and Offset Deals 14
4. Promotion of Lean Defense Production 15

II. Confronting the Mismatch Challenge: Adjustment Programs for Displaced Defense Workers 17
Defense Workers and EDWAA 18
Lessons Learned 25

III. Encouraging "High Road" Restructuring: Firm-Targeted Efforts to Avert Defense Worker Dislocation 28
Market Diversification, Internal Restructuring and Incumbent Worker Training 30
Union-Management Partnerships for Modernization and Conversion 33
Lessons Learned 37

IV. "This isn't about jobs:" The Disappointing Outcomes of Technology Reinvestment 39
The Demand Pull Issue 41
Lessons Learned 43

Building Capacity for a Just Transition: Lessons from Military-Industrial Layoffs in the 1990s 45

Introduction

As the pace of international market integration and technological innovation quickens, American workers are more often confronted with displacement and the need to find new workplaces, even new occupations. Do we, in the United States, have satisfactory mechanisms for ensuring a just transition? In this study, we examine the experience of American defense industry workers in the wake of the Cold War as a way of reviewing and evaluating national policies toward worker adjustment and re-employment as they have evolved in the 1990s. Defense sector workers are the single largest group displaced from U.S. private industry over the past decade - some 1.4 million workers in the sector lost their jobs between 1987 and 1996. Their experiences offer a powerful lens through which to evaluate the ability of American institutions and policies to move skilled labor quickly from one set of activities to other productive ones in the economy.

American defense worker policies in the1990s should be a high water mark, at both national and state/local levels, for two reasons. First, structural decline in the 1980s in auto, steel and other heavy industries sparked new interest in the special problems of displaced workers. At the state level, some officials crafted industry-specific policies to address layoffs and strove to integrate these policies with worker retraining and upskilling. At the national level, the Department of Labor (DOL) acknowledged that employment policies targeted at entry-level workers did not work for this new group of structurally unemployed and pledged to pioneer new types of programs. When the Clinton administration came into office in 1993, incoming DOL leaders pledged to revamp and beef up funding for displaced worker programs and place them center stage.

Second, the federal government acknowledged a special responsibility for the unemployment associated with the end of the Cold War. Planned defense spending cuts of nearly

40% in real terms would displace more than 2 million soldiers, civilian Department of Defense employees and defense industrial workers in a relatively short period of time – less than a decade – and the federal government was determined to plan for the transition. The Clinton administration in particular committed itself to playing an active role through the Defense Reinvestment and Conversion Initiative, a set of programs in the Departments of Defense, Energy Commerce and Labor whose combined funding amounted to more than $16.5 billion over the years 1993-7 (Table 1). The goal of many transition policies was to redirect resources that had been dedicated to U.S. military superiority toward critical national priorities including health care and infrastructure. According to President Clinton, a key part of that re-dedication of resources involved the re-deployment of the defense skill base. Defense officials, working with their counterparts in the Energy, Labor and Commerce Departments in the 1990s, had the opportunity to manage the post-Cold War draw-down in an exemplary way, promulgating policies that limited job loss and catalyzed new career possibilities for displaced industrial workers.

Has defense worker policy in the 1990s fulfilled its original promise? This paper argues that the record is mixed, on two counts. First, despite a strong initial commitment to address defense workers' situations, and despite the opportunity to make the defense conversion initiative a showcase for exemplary new training, re-employment and job creation policies, the main hallmark of federal transition policy has been acquiescence in wholesale defense industry consolidation and restructuring. This process that has viewed workers largely as impediments to cheaper weapons production. Through their post-Cold War military-industrial policies, the Pentagon and the Clinton Administration have:

- Agressively supported mergers among the nation's largest defense firms;
- Encouraged firms to seek foreign military markets rather than to diversify at home;

- Privileged short-term technological fixes over more labor-friendly restructuring strategies; and
- Foregone opportunities to invest in projects that would create new jobs compatible with defense workers' skills.

In part because of these policies, worker layoffs have been out of proportion to the magnitude of defense procurement cuts, even as the profits and stock prices of defense industrial companies remain high. Transition policy might have -- and should have -- prevented this level of worker displacement.

Second, defense workers who were laid off often did not find the assistance necessary to make satisfactory job and career changes. Local displaced-worker programs, while they varied considerably from place to place, were frequently unprepared -- in terms of financial resources or administrative capacity -- to serve this population. Although a strong economy in this period helped to keep aggregate unemployment rates low, our research indicates that private sector defense workers did not, on average, experience rapid re-employment at wages comparable or better to those they had received in their former defense-related occupations. We estimate that a majority of the workers displaced from defense-related industries between 1987 and 1997 now work at jobs that pay them less than their former wages and that fail to take advantage of their defense-bred skills, and a sizable minority has experienced a drop in earnings of 50% or more. The federal government has spent much more on transition assistance for involuntarily discharged soldiers and civilian Department of Defense employees than it has done for defense workers in the private sector. Under the Defense Reinvestment and Conversion Initiative (DRCI), for example, about $3.4 billion went to assist people who had been employed directly by the military, and $159 million to

retraining and re-employment assistance for displaced private sector defense workers, a notable discrepancy (see **Table 1**).[1]

Public capacity to address the labor aspects of economic transition has made progress over the decade. Some federal initiatives -- experimental worker adjustment and skills upgrading programs funded through the Department of Labor, business revitalization and diversification efforts funded by the Departments of Commerce and Economic Development, and public moneys for R&D and procurement in transportation, space, energy, environment and welfare -- have led to positive results for workers. Significantly, because most adjustment funding has been administered through the federal system, the success of transition policies on the ground has depended greatly upon state and local capability to make the most of federal dollars. In the 1990s, areas with chronic experience of structural decline -- such as Long Island and the New England states -- possessed institutions prepared to deal with the challenges of defense displacement. These regions were most likely to mount creative and effective labor adjustment efforts. A central conclusion of this study is that their experiences should be used to help build the capacity of other state governments.

Given the volatility of the global marketplace and the mobility of capital in the contemporary U.S. economy, it is likely that other industries will face structural decline and mass displacement in the years ahead. The experience of defense workers in the post-Cold War United States therefore contains lessons for the future. It is around these lessons that we have structured this paper, synthesizing the results of six years of field research by staff and fellows at Rutgers University's Project on Regional and Industrial Economics (PRIE).[2] After reviewing post-Cold

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[1] Displaced defense industry workers also have had access to the to the unemployment insurance system and to displaced worker assistance provided under EDWAA of the Job Training Partnership Act.

[2] PRIE researchers have tracked defense industry trends and documented the adaptation of militarily specialized firms, workers and communities in the U.S. and abroad during the years following the end of the Cold War. The ideal data for a technical paper on defense worker adjustment would be a national sample of displaced defense workers, a sample that enabled us to compare the re-employment outcomes of workers displaced in different regions and from different

War trends in defense sector labor markets in Section I, we move in Section II to analyze military industrial policy's impact on defense employees, showing that despite the Clinton Administration's stated commitment to defense workers, defense industry policies in this period frequently had the effect of eliminating jobs or reducing returns to labor. In section III, we critically evaluate displaced worker policies and services (nationally funded but locally administered) available to defense workers who had lost their jobs, while in Section IV we examine the labor-related lessons to be gleaned from defense transition initiatives whose clients were not workers *per se* but rather defense firms. Finally, in Section V, we assess the largest component of the Defense Conversion and Reinvestment Initiative, the Technology Reinvestment Project, in terms of its success in fulfilling its promise as an instrument for generating jobs compatible with displaced workers' skills.

Our key conclusions are summarized below:

- (Section I) Economic adjustment occurs in a national policy context – in this case the downsizing of the military industrial base. The federal government, through its defense industry policies, has endorsed a radically "marketized" approach to labor in an industry that has long enjoyed immunity from market discipline, a move that has resulted in workers' bearing the brunt of the costs of post-Cold War downsizing as their employers continue earning high profits. Defense policy has also reinforced (rather than counteracted) the private sector's tendency to view highly skilled people -- particularly skilled manufacturing workers -- as resources not worth maintaining and "re-using" in the context of an economic adjustment process. A just transition must draw upon the economic power and pace-setting capacity of the federal government to create a climate in which firms have an incentive to retain workers -- to see employee skills as an asset worth preserving, even in the midst of restructuring and cost reduction.

- (Section II) Programs geared toward re-employing displaced workers meet their goals when they dedicate brainpower and financial resources to matching and adapting existing employee skills to identifiable opportunities in local labor markets. A just transition must incorporate national leadership in identifying skillset compatibility between declining and growing occupations; funding and income support for long-term re-training; and redoubled efforts to

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defense-specialized industries. No such sample was available, however – longitudinal data on displaced workers in any sector is notoriously under-collected – so the results in this paper derive from a compilation of statistical samples from individual case studies, joined with extensive interviews of federal government officials, state and local program administrators, labor leaders, community activists and representatives of defense-specialized firms throughout the United States.

achieve cooperation between employment services professionals and economic development professionals at the local level.

- (Section III) Transition programs directed at businesses retain jobs when they encourage training-intensive (as opposed to technology-intensive) strategies for workplace restructuring, market diversification and the reorganization of production. A just transition must focus on incumbent as well as laid-off workers, since upgrading incumbent worker skills can both make firms more competitive and develop employees' capabilities in ways that serve them well if they lose their jobs later on.

- (Section IV) If they are to create jobs, federal investments in emerging technologies require not just the "push" of initial R&D expenditure but also the large-scale market creation induced by government procurement policies. Small, targeted initiatives such as the ISTEA highway program, have drawn on the procurement stimulus to a limited extent, but much of the potential for an effective "demand pull" job generation strategy is still unrealized. A just transition must incorporate 1) regulation that stimulates private markets for leading-edge products and 2) procurement policy that creates initial public markets for them.

I. Defense Labor Dynamics: At the Nexus of Markets and Policy

The post-Cold War restructuring of the American defense industry and the elimination of more than a million defense-related jobs in the private sector has been one of this decade's most significant labor market phenomena. Between 1987 and 1996, defense-related private sector employment in the United States declined from 3.5 million to 2.1 million, a 40 percent drop (Thomson 1998). While those who lost jobs during this period represent a relatively small fraction of the U.S. labor force, the economic and political significance of defense industry job loss is out of proportion to its numerical importance: nearly one million of those who lost defense-related jobs in the 1990s worked in the manufacturing sector, as engineers, technicians, and skilled blue-collar employees. Net manufacturing job loss in the defense sector between 1987 and 1996 amounted to 922,000 workers, nearly 5% of the entire manufacturing labor force in 1987 (Bureau of Labor Statistics). Defense industry workers have traditionally been better-paid, higher-skilled, and more likely to be represented by unions than their non-defense counterparts.

Moreover, even accounting for the negative demand shock associated with the end of the Cold War, defense workers, particularly blue-collar workers, have been displaced in disproportionate numbers. In 1996, Pentagon procurement outlays were $51 billion -- around the same amount spent on weapons in 1979, just before the dramatic spending increases of the Carter-Reagan build-up. But defense-related production employment is far below its 1979 level. Documented job losses in the defense industry have exceeded Bureau of Labor Statistics projections from the early 1990s.[3] Moreover, sales and employment statistics for a sample of nine major defense contractors show that employment declines have outstripped declines in sales. These nine contractors as a group underwent sales declines of 5.7% from 1989 to 1997 but laid off over 41% of their employees (**Table 2**).[4] The same trend is occurring in defense-specialized industries in the aggregate (**Tables 3 and 4**). During the 1980s build-up, an estimated 815,000 manufacturing jobs were created, but 923,000 defense-related manufacturing jobs have been lost during the draw-down. It is clear that other significant changes in defense manufacturing firms have accompanied the drop in military spending.

For those working in steel, autos, consumer electronics and other hard goods industries during the 1970s and 80s, mounting international competition and the gradual breakdown of a New Deal-era détente between workers and employers ushered in enormous changes. The financial restructuring of U.S. manufacturing entailed consolidations, buy-outs and mergers in many industries, with a renewed emphasis on short-term profitability and shareholder return over longer-

[3] The Bureau of Labor Statistics estimated in 1993 that 118,000 manufacturing jobs would be lost on average in each of the following five years. A bottom-up accounting of layoffs for the years 1993 and 1994 (Evans-Klock and Raffel 1994, Evans Klock 1994) estimated the number of layoffs at 164,000 in 1993 and 235,000 in 1994, well above the BLS estimates even accounting for possible defense-related job creation.

[4] At the company level, Northrop Grumman's sales declined by 15% in real terms between 1989 and 1997, but its workforce dropped by nearly double that, or 26%. Lockheed Martin saw sales increase by 35% but increased its workforce by just 8% during this period (Table 2).

term investment. At the micro level, restructuring entailed the introduction of sophisticated computer-driven production equipment, the adoption of "lean business practices," and workplace reorganization that required employees to work in teams, master multiple skills and increase productivity. Technological and financial restructuring eliminated production jobs (Harrison 1994).[5]

As commercial industry was transforming during the 1980s, however, most defense firms and workers practiced business as usual under the federal government's Cold War industrial policy – a policy that financed a small number of oligopolistic suppliers to design, prototype and produce (in short runs or "batches") technologically sophisticated and elaborately engineered defense systems at high cost. Competition in the Cold War defense industry had much more to do with demonstrating engineering prowess than with achieving cost efficiencies, and the tendency to "gold-plate" weapons systems intensified during the Carter-Reagan build-up, which saw military procurement authority double in real terms between 1979 and 1985 (**Figure 1**). In 1987, private sector defense-related employment peaked at 3.54 million workers (**Figure 2**). The growth of manufacturing employment that accompanied the military build-up, particularly in defense-specialized states, ran counter to a secular trend of manufacturing job loss that was occurring in the overall economy.[6]

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[5] According to one estimate, the capital intensivity of U.S. manufacturing increased 28 percent between 1987 and 1995 (Carson 1995).

[6] During the Cold War, defense contracting "produced a new economic map of the United States" (Markusen et al., 1991: 3), and the contours of this map are reflected in the patterns of post-Cold War job loss. Losses in many places occurred abruptly: the Los Angeles region lost 127,000 aerospace industry jobs between 1988 and 1994, 45% of its total. St. Louis lost 15,000 defense jobs between 1988 and 1993, and Long Island lost 20,000 during the same period (Markusen and Hill 1997). In Connecticut, which contains several of the most defense-dependent counties in the nation, 28,000 jobs were lost in just three industries – aircraft, shipbuilding and ordnance -- between 1989 and 1995. The 1990s defense industry restructuring has had a geographic logic of its own that has favored southern and non-Californian western locations in place of southern California and the northeast (Oden 1996). This logic has, however, operated in tandem with across-the-board job cuts in all regions that specialize in military production.

In the 1990s, the defense industry's heyday has ended. Since weapons procurement outlays peaked at $110 billion in 1987, several Congresses and two Presidents have cut the U.S. military budget by a third in real terms and trimmed weapons procurement by nearly 70%. During this same period, restructuring and lean business practices have taken hold in the defense industry. An increasing amount of military production has been transferred overseas as a result of offset deals, in which contractors grant buyer countries licenses to produce, partially or completely, the weapons systems they are buying. About 1.4 million U.S. workers have lost defense-related jobs since 1987. In defense-specialized regions, government officials have discovered that the increase in defense jobs during the 1980s was at best a temporary let-up in a secular trend of deindustrialization – and at worst a development that concealed the scale of that trend and delayed needed policy responses to it. Defense workers, generally highly skilled but older than average and often unfamiliar with the new standards and processes that many commercial firms had instituted during the 1980s, have found themselves navigating a new, "post-industrial" job market.

The major changes that have occurred in defense sector labor markets over the last decade – the increased substitution of capital for labor in manufacturing, operations, a shift from goods to services, a decline in union coverage, and a shift of industrial activity from the Northeast to the South and West – are similar to changes in other durable goods industries. Indeed, estimated defense-related manufacturing employment has been in a secular decline since the late 1970s, while defense-related service employment has risen by over 200 percent (**Table 5**). It could be suggested that an overall restructuring of America's labor markets simply "caught up to" defense workers after the Cold War's end.

In another sense, however, military industrial policy has played a powerful role in the changes. With respect to the defense industry more than any other, the U.S. government is a largely

monopsonistic buyer, playing a direct and major part in setting economic terms and creating a "playing field" for competing firms and workers. While defense workers have become more exposed in the 1990s to market forces operating in the civilian economy, they have remained tied to federal priorities and demand flows in a way that is highly unusual. We argue that federal officials, because of their quasi-employer relationship to defense industry workers, had an opportunity to manage the post-Cold War draw-down in an exemplary way, promulgating policies that would both limit job loss and catalyze new employment opportunities for displaced workers. By and large, however, they chose to manage the draw-down in a way that was much more favorable to defense company managers and shareholders.

Impacts of Defense Industrial Policy on Workers

As he took office in 1992, President Bill Clinton vowed that after achieving victory in the Cold War, the nation was poised to cash in on a "peace dividend." Following the advice of economic experts on his own staff and in the academic arena, Clinton made plans to substantially reduce the military budget and to spend the savings financing an activist role for government in post-Cold War economic conversion—a process of moving federally sponsored talent and resources from dead-end military projects into research and development efforts that would enhance the commercial competitiveness of U.S. firms in growing world markets. At his post-election Economic Summit, for instance, he proposed an aircraft industry policy to create civilian job opportunities for laid-off defense aerospace workers. In this view, the United States was now in greater danger from commercial competitors than from military opponents, and federal spending should reflect this new reality.

In Washington, however, the long-entrenched forces of supply-side resistance to military downsizing (which included top Pentagon officials, most defense business leaders, members of

Congress, and parts of the labor movement) successfully lobbied against bold demilitarization. By the time of the Pentagon's Bottom-Up Review (BUR) in 1993, a consensus had developed that the United States, while it should spend less money on defense, still needed a substantial military research and industrial base. In the wake of the BUR, the Clinton Administration backed away from its original plans, and the Pentagon announced that it would achieve desired spending reductions not primarily by reducing U.S. military industrial capacity but through efficiency gains among defense suppliers, through procurement reform and through industry restructuring (Oden 1998).

Rather than reversing the "Carter-Reagan build-up" of the 1980s, then, the Pentagon instead encouraged a wholesale re-orientation of America's military industrial base, providing policy incentives to firms to consolidate, downsize, internationalize and to maintain their specialization in defense production. Four policies pursued in this context help to explain why employment cuts in defense-specialized manufacturing industries were so much deeper than expected.

1. Industry consolidation vs. market diversification

A major factor influencing private sector defense job loss in the 1990s has been the consolidation of the defense industry. As in many other industries before it, defense executives in the 1990s increasingly adopted and cited the logic of creating focused or "pure play" companies, as advanced by Wall Street equity analysts and investment bankers. Wall Street pressures and executives' own ambitions were augmented by explicit and tacit policy signals from the Pentagon. At a 1993 dinner for defense executives which has come to be known as "the Last Supper," then-Defense Secretary Les Aspin and Deputy Defense Secretary William Perry reportedly implied to executives that they should begin reducing capacity, and suggested that mergers and divestitures would be preferred strategies (Center for Strategic & International Studies 1998). The Administration and the Pentagon

subsequently helped to mute Federal Trade Commission and Justice Department reservations about defense industry mergers (Markusen 1997b). Pentagon officials also encouraged consolidation by agreeing to reimburse consolidating firms for a host of merger-related costs in return for anticipated future savings.[7]

The 1998 failure of giant Lockheed Martin's attempt to acquire the aerospace firm Northrop Grumman (itself the product of a 1993 merger) signals the Pentagon's belated cooling toward consolidation. In the wake of the merger spree, however, the number of large contractors accounting for two-thirds of Pentagon defense product sales has fallen from 17 to 8 (Office of the Secretary of Defense 1997:20), with an increasingly high percentage of DoD contracts going to four giant "systems-integration houses:" Lockheed Martin, Raytheon, Boeing and Northrop Grumman (see **Figure 3**). Overall, consolidation pressure has overridden incentives toward market diversification and potentially undermined the government's originally stated goal of procuring high-quality weapons at low cost. While merged firms hypothetically could rationalize defense production by combining redundant operations, many of them instead have expanded participants' market portfolios, possibly creating economies of scope but also potentially undermining competition. Moreover, there is little evidence that consolidation has actually eliminated production lines or reduced capacity. Its only certain effects are marked increases in the stock prices of large defense firms (Oden 1998, Markusen 1997b, Sapolsky and Gholz 1998). Most defense firms

[7] The Pentagon's estimate of the amount it would release in connection with five such mergers studied by the General Accounting Office in April 1997 was $775.2 million, of which about 10% was projected to go to worker severance pay and services. Costs reimbursed in connection with other mergers and mergers that took place after April 1997 are unknown. Firms that receive the payments are not required to demonstrate that they have in fact achieved the projected cost savings, and the United States General Accounting Office has concluded that the savings have amounted to only 15 to 25% of what was promised (GAO/NSIAD-97-97, Apr. 1, 1997).

involved in consolidation and divestiture significantly outperformed the S&P 500 index during the first seven years of the 1990s (**Table 6**).

2. ***Continued military orientation of federal research***

Congressional leaders and Presidents have long denounced as "industrial policy" the use of federal funds to incubate fledgling industries and technologies. The Pentagon, however, through its support for high-risk research and its demand for the products of that research, has provided critical early investments in industries where the U.S. is now a global leader both militarily and commercially.

In recent years, however, many have contended that a Pentagon-led industrial policy is no longer sufficient as a mechanism for subsidizing risk and stimulating innovation in the private sector. Economists and competitiveness advocates have argued that to strengthen American industry and exports, boost profits, and create jobs, the U.S. should invest strategically in non-military technologies (Tirman 1984, DeGrasse 1984, Alic, Branscomb, et al. 1992, Markusen and Yudken 1992).

In the early 1990s, defense conversion and disarmament advocates and organized labor representatives joined the call for a civilian industrial policy, urging the federal government to redirect military R&D resources into investments in high-tech commercial projects. The hope of many was that labor displaced by plummeting defense demand might be reabsorbed in the production of electric vehicles, high-speed trains and environmental technologies. But while a partial reallocation of resources from defense to civilian R&D has taken place, less than half of the $12.7 billion annual savings yielded by cuts in military R&D has been re-dedicated to civilian research priorities (Bischak 1997). Government civilian R&D programs remain a weak inducement for defense executives choosing between pursuing market diversification and new product

development or "sticking to their knitting" – i.e., continued specialization in the defense market. And while many had hoped that the Clinton Administration's Technology Reinvestment Project would provide critical working capital to entrepreneurs working to adapt military technologies to commercial markets, TRP in practice narrowed its mission to the "spin-on" of commercial technologies into military supply chains (Oden, Bischak and Evans-Klock 1995, Stowsky 1996, Bertelli 1997). Moreover, TRP administrators were indifferent if not hostile to the idea of making job retention or creation a goal of the project. Thus, the original promise of technology reinvestment as a job creation strategy for displaced defense workers has gone unfulfilled.

3. Support for Arms Exports and Offset Deals

Another possible counterweight to defense layoffs lay in a different type of market diversification – the expansion of defense sales to other nations. But here too, the results of federal policy have been largely negative in terms of their impact on workers. Supported by firms and some unions, the post-Cold War Pentagon has aggressively encouraged the sale of weapons abroad. In 1996/97, the U.S. government spent $7.8 billion promoting foreign arms sales, in the form of grants and subsidized loans to buyer countries, giveaways of "excess" U.S. military equipment, support for international air shows and weapons expositions, and the salaries of 6,300 personnel in the Departments of Defense, State and Commerce. This represented an increase of 3% over 1995 levels and 11% over 1994 levels (Hartung, 1998).

Efforts to sell U.S. weapons abroad have paid off for firms, but not for American workers. While the international market for arms decreased by more than 50% from 1985-95, the U.S. share of that market grew from roughly a quarter to roughly one half. The surprising profitability of a number of large defense firms in the 1990s is attributable to such sales. But union expectations that exports would preserve defense jobs have been dashed by co-production agreements – in which

contractors grant buyer countries licenses to produce, partially or completely, the weapons systems they are purchasing. Co-production deals with European nations often require 100% of the purchased item to be produced by European workers. Increasingly, components of products bound for the Korean and Taiwanese military markets are manufactured in Korea and Taiwan under the authority of U.S. firms or joint ventures.[8] The value of offsets (co-production and indirect offset agreements combined) has fluctuated greatly over the last fifteen years. But since 1993, the value of offsets as a percentage of all military export contracts has climbed from 35% to 80%, indicating that substantial weapons production for the non-U.S. market is taking place outside the United States (U.S. Department of Commerce 1997). Thus, encouraging exports of U.S. weaponry has proved not to be a tenable job retention policy.

4. Promotion of Lean Defense Production

A final cause of deep defense industrial job loss is the relatively recent discipline of "lean production" in the industry. In an effort to trim costs and "do more with less" since the end of the Cold War, the Department of Defense has mounted an acquisition reform effort whose goals include introducing commercial business practices into the defense procurement system, making cost a driving variable in weapons design, and encouraging suppliers to adopt advanced production technologies and lean business practices.

Defense reform advocates agree that these measures are long overdue (Gansler 1995). However, since the primary objective of acquisition reform is to reduce costs and enable the Pentagon to invest more of its budget in the development of "next generation" weapons systems,

[8] The other form of offset deal, the "indirect offset," involves counter-imports into the United States of unrelated products and services; for example, the buyer country may negotiate an agreement to export shoes or metal products into the U.S., to be wholesaled by the American firm that sold the weapons system. In 1993 and 1994, about 30% of all offset deals were co-production agreements; this figure roes to 39.8% in 1995 (U.S. Department of Commerce 1997). Indirect offsets thus displace workers in unrelated sectors.

defense officials have been indifferent to the issue of potential job loss among both managerial and production workers as a result of the new practices. Many of the lean production efforts undertaken in defense firms have involved strategies such as downsizing, re-location and outsourcing, while productivity strategies compatible with job retention (incumbent worker training, for example) are rejected as incapable of producing short-term results. While a few defense production facilities have relied on innovative labor-management partnerships to achieve efficiency and productivity gains, the majority have achieved efficiencies simply by cutting jobs. The Connecticut workforce of Pratt and Whitney Aircraft, a division of United Technologies Corporation, went from about 30,000 in the mid-1980s to 15,000 in 1997, due largely to downsizing and re-location of production (Harrity 1997). The workforce in Raytheon's Massachusetts plants has shrunk similarly, from about 30,000 employees to less than 15,000 today (Osborne 1997).

While cuts in weapons procurement were bound to result in job loss, the federal policies under which military-industrial restructuring took place significantly influenced both the extent of defense employment decline and the re-employment prospects of displaced defense workers. The federal government – both because of its special responsibility to defense workers and because of its unique relationship to defense firms -- had an opportunity to steer the military restructuring effort in a manner that would yield positive outcomes for workers even in the midst of an overall reduction in capacity. The Administration and the Pentagon failed to take that opportunity, first by allocating a relatively low percentage of defense conversion funds to private sector worker readjustment (see Table 1) and second by orchestrating other policies that promoted downsizing and in effect canceled out the positive impact of worker adjustment efforts. While the policies in the left column of **Table 7** were not the only factors influencing the labor market trends in the right

column, it is clear that federal policy-makers have not made use of the means at their disposal to improve the economic climate that defense industry workers have faced in the 1990s.[9]

II. Confronting the Mismatch Challenge: Adjustment Programs for Displaced Defense Workers

While displaced defense workers' prospects in the post-Cold War era are shaped by a broad array of factors, most analysts treat the problem of defense worker adjustment as a straightforward supply-demand mismatch. In their view, shifts in national priorities are diminishing demand for the output of defense-specialized industries, and workers from these industries are consequently being released into the labor market. Proponents of this view have also tended to believe that displaced defense workers have little that distinguishes them from other displaced workers, and should not receive targeted services (see **Box 1**). The problem as defined is simply one of labor re-absorption, and the responsibility of defense worker adjustment has fallen primarily to the U.S. Department of Labor (DOL). This section asks the question, "have DOL's worker adjustment programs been equal to the massive task of directing displaced defense workers to appropriate new jobs?"

Relying on evidence from several samples of defense industrial workers, we find that DOL services to displaced defense workers, delivered primarily as general dislocated worker assistance under the Job Training Partnership Act, improved over the course of the decade. A few innovative

[9] In defense-specialized regions, moreover, the economic development policies of state and local governments responding to post-Cold War restructuring have sometimes been of questionable benefit to workers and taxpayers. As the defense companies' position becomes more like that of traditionally competitive manufacturing industries, firms often threaten to move from one area of the country to another in response to tax incentives. State and local governments respond with generic financial offers and abatements that have little to do with the specific needs of firms experiencing defense-related demand shocks and so are unlikely to stem the tide of displacement. Pratt and Whitney Aircraft received a sizable package from the State of Connecticut even as it laid thousands off, and Massachusetts economic development personnel successfully mounted a campaign to lower taxes on manufacturing inventories, resulting in a law known as the "Raytheon tax." Several states also helped companies by "reforming" their state unemployment insurance and workers compensation insurance systems during this period. Through these actions, states lower companies' costs and arguably help them to retain jobs, but as they do this they reduce the social safety net for injured or laid-off employees. (Ward 1998).

programs demonstrate the potential of efforts that rigorously examine the local labor market, reach out to potential employers, and help workers to assess, re-frame and if necessary upgrade their existing defense-bred skills. These programs would be equally applicable to displaced workers in other sectors.

Defense workers might have had better outcomes overall, however, in the context of programs that were better suited to relatively skilled participants and that offered the flexible and sometimes unusually extensive financial resources necessary to prepare structurally unemployed workers for new occupations. DOL services were also profoundly limited by the economic conditions under which they were delivered: jobs suited to the skills of laid-off defense workers were relatively scarce in the 1990s, and the agencies providing job search and retraining assistance were disconnected from economic agencies whose actions might have been able to help affect the level of demand in the labor market.

Defense Workers and EDWAA

Traditionally, employment and training services offered through the Department of Labor have had two foci: basic skills and work readiness preparation for low-skilled individuals and job search assistance aimed at the frictionally unemployed. As displaced manufacturing workers entered the system during the 1980s, critics argued that DOL was failing to focus programmatic attention on remedies for structural dislocation.[10] In particular, critics asserted that local providers did not adequately distinguish their dislocated worker training services from services to disadvantaged individuals seeking entry-level jobs, even though the needs of these two groups diverged substantially (Mueller and Gray 1994, Holl 1998).

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[10] These workers had poor prospects of being re-employed in industries where their existing human capital was in high demand.

By the early 1990s, however, displaced workers had begun to command more resources and more attention. In 1988, Congress authorized the Economically Dislocated Worker Adjustment Act (EDWAA) as a separate title (EDWAA) of the Job Training Partnership Act. In this decade, the local service delivery areas (SDAs) responsible for administering the bulk of EDWAA funding have developed job search assistance and skills upgrading and re-training strategies that strive to meet the needs of dislocated workers as distinct from those of workers seeking entry-level jobs (Holl 1998).[11] While a 1992 National Governors' Association survey reported a severe shortage of EDWAA funds compared to the number of applicants (Mueller et al. 1993), the program served 40% more people in 1995 than in 1992, and its original $200 million annual budget has steadily increased to $1.35 billion for 1998, a gain of over 300% in real terms (Department of Labor 1997). Additionally, the percent of EDWAA participants who enter employment after receiving services has increased as service delivery has been refined.[12]

The uptick in EDWAA funds and the program's increased focus on the specific needs of dislocated workers have coincided with the influx of displaced defense industry workers onto the job market. In 1991, $150 million specifically earmarked for displaced defense industry workers was added to EDWAA's budget as the Defense Conversion Adjustment Program (DCA) (Lightman 1991). According to Employment and Training Administration officials, DCA presented a key opportunity to "push the envelope" further in developing displaced worker services. In its role as

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[11] The Department of Labor distributes federal EDWAA funding by formula to state governments, which then distribute funds to program administrators in local Service Delivery Areas (SDAs). The Department's role is primarily an advisory and technical assistance one; federal job training programs, according to Holl, are "predicated on the idea that the design and delivery of workforce programs need to happen at the local level and be driven by local conditions." At both the federal and state levels, some discretionary money is available to officials to fund demonstration projects that may pioneer new service models for SDAs to emulate or learn from.

[12] Increases in EDWAA placement rates attributable to service improvement are not easily separated from increases attributable to improved economic conditions.

advisor and monitor, DOL has encouraged innovation among local providers, especially those receiving grants under an experimental $11 million effort called the Defense Conversion Adjustment Demonstration. "As we implemented DCA, " says one official, "we had the opportunity to encourage the system to look at the particular needs of displaced workers and to plan ahead in partnership with employers that knew they would be laying off people" (Holl 1998). Available job placement data indicates that displaced defense workers served by EDWAA did neither better nor worse than the EDWAA population as a whole (**Tables 8 & 9**). The approaches described below, however, suggest that DOL's efforts to respond to the plight of defense workers served as models for badly needed new approaches to the implementation of displaced worker programs in general.

One type of response involved better regional coordination among the Department of Labor's local Service Delivery Areas. Sixteen SDAs in the Los Angeles region formed a consortium in 1995 that has allowed displaced aerospace workers a broader choice of training options than they would otherwise have had. Workers choose from a list of high-rated training vendors and the consortium acts as a buying organization to maximize available training funds (Holl 1998). This innovation is particularly important in Los Angeles, where government capacity is fragmented and dispersed across 80 separate and often competing incorporated cities (Markusen and Hill 1997).

Other innovative approaches to EDWAA service delivery involved close partnerships with labor unions. In the Hartford, Connecticut area, IAM District 91, which represents aerospace and defense workers at several United Technologies Corporation (UTC) plants, helped oversee the expenditure of $14 million in DOL retraining funds for laid-off workers, both salaried and hourly production employees. The involvement of a full-time union Training Coordinator paid by UTC

enabled the creation of on-site re-employment centers where workers could apply for Unemployment Insurance (UI), purchase catastrophe health insurance and access a range of re-employment services including counseling, skills assessment, and customized referrals to training (Meglin 1998). Partly because of their union affiliation, District 91 employment centers offered opportunities for laid-off workers to network with and support one another.[13] The comprehensive, employer-specific approach of the centers, pioneered by District 91 and other local providers, is now becoming more common throughout the EDWAA service delivery system.

Some DOL-union partnerships, going beyond the realm of basic service delivery, have helped to assess local labor markets and develop job opportunities within them. In the Groton/New London, CT area, an effort originally initiated by local peace activists to help convert the regional economy from military to non-military production has become a major re-training project for former employees of the General Dynamics-owned Electric Boat submarine shipyard.[14] The Southeastern Connecticut Private Industry Council (the EDWAA service provider), the Metal Trades Council (an umbrella body of Electric Boat's 11 production unions) and the non-profit Work and Technology Institute (with help from the Community Coalition for Economic Conversion) have collaborated to implement a DOL-funded demonstration program whose goal is to help laid-off shipyard employees leverage their specialized trade skills to the greatest extent possible in the regional labor market (see **Box 2**). Having discovered that many firms in Connecticut are experiencing a shortage of skilled manufacturing, trade and technical workers (due in large part to the need to replace retiring workers), the project has sought to help laid-off workers a) understand what skills they can market to outside employers b) describe those skills in a

[13] The idea of serving UTC workers with site-based had come from the union, whose leaders went to Washington to petition DOL for discretionary funds. Says one union employee, "We wanted to go after our own facility because we felt the state was giving substandard service...we went to Washington to request the funds and got the company to sign on belatedly when the money came" (Meglin, 1998).

language those employers understand and c) identify areas in which they may be able to find jobs after a relatively brief skills upgrade or re-certification. For example, staff and workers together determined that many former EB employees are well-matched to building trades occupations, and have worked with the Connecticut Department of Labor to get them certified as construction trades workers. Others have taken short courses in computer-numeric machining and fiber optics installation (both in local demand) that build on the metal-working and electrical skills they used in the Electric Boat shipyard (Hedding 1998).

DOL guidance and discretionary funding through DCA, then, has encouraged many local service providers to develop new models for responding to the challenge of worker adjustment. Based on its experiences collaborating with unions, DOL has mounted new efforts to institutionalize direct union participation in adjustment and re-employment efforts. Another lesson learned through DCA projects was that it is often worthwhile for DOL to spend money upgrading the skills of incumbent workers (Teegarden 1997). In some cases, incumbent worker training helps to strengthen businesses and avert layoffs, while in others it offers workers a chance to gain portable skills – particularly important if they are at risk for layoff in the future. Starting July 1, 1998, DOL had authority to use EDWAA demonstration funds to serve incumbent workers (Holl 1998).

Despite these innovative efforts, however, many former defense industry workers had negative experiences with EDWAA (Mueller et al. 1993, Mueller and Gray 1994). While the workforce development system was committed in principle to addressing their particular labor market needs, local SDAs frequently did little to distinguish services for structurally dislocated workers from those that served the frictionally unemployed. Job search assistance was helpful for

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[14] Electric Boat has laid off more than 6,000 people since 1989.

people with good prospects for immediate re-employment, but served a limited purpose for engineers and production workers with specialized skills. Due to strict limits on the quantity of funding that could be devoted to counseling, little attention was given to assessing workers' existing technical capacities and identifying occupations that built on them; rather, participants were shown boilerplate lists of growing occupations (**Table 10**) and asked to base re-training decisions on this information. Even the re-training components of the programs were focused on quick labor market re-entry. In the words of one researcher, "retraining for positions that would allow defense workers to recoup their former pay would require considerably greater per-worker funding than has been available."[15] Even had funding been available, workers who might have wished to undertake long retraining courses were limited by a lack of income support; most had to rely on their state Unemployment Insurance benefits to support themselves and their families, and baseline UI lasts only 26 weeks.

Most fundamentally, local EDWAA programs were not in a position within most local governments' institutional structures to address the critical demand-side issues posed by defense workers' displacement. Officials, argue Mueller and Gray, were working within a structure aimed at lowering short-term, frictional unemployment, while "the deeper issues raised by structural unemployment [were] beyond the scope of re-adjustment programs" as conceived and implemented (1994: 25). Ideally, local EDWAA administrators would have formed ties with economic development officials responsible for employment generation. But often, worker adjustment was perceived by state and local officials as a social service, unconnected with business attraction and job creation efforts. A state economic development official interviewed in New Jersey commented,

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[15] Kodrzycki, 1995, p. 14. EDWAA participants typically entered training courses that lasted 9-12 weeks.

"Anything to do with laid off workers we don't get involved with...we finance business" (Mueller and Gray 1994: 26).

When they did address job creation, state and local economic revitalization plans often had little to do with the skills base of a region. For example, a study of defense adjustment in Los Angeles noted that a generic focus on the "business climate" distracted political and financial resources from an alternative strategy stressing incentives for transferring military industrial skills and technologies into new sectors (Oden et al. 1996). Local government representatives in the Groton-New London area in Connecticut, where the DOL demonstration is now being implemented, initially mounted an effort to revitalize the area through tourism, an industry whose skill requirements and wage levels were an extremely poor match for laid-off shipyard workers. Manufacturing employment in New London County declined by more than 30% between 1989 and 1996, from 32,000 to 22,000 in a local workforce of between 98,000 and 99,000 (County Business Patterns, U.S. Bureau of the Census), and a number of former shipyard workers took low-wage positions in Connecticut's Foxwoods Casino. A different regional development strategy (for example, one focused more aggressively on expanding the area's manufacturing base and upgrading shipyard workers skills to prepare them for state-of-the-art manufacturing work) might have helped to produce different outcomes.

The partnership among federal, state and local public sector agencies characterizing the delivery of displaced worker services in the United States strikingly differentiates worker adjustment policy from trade and other contemporary macroeconomic policy. The JTPA's philosophy is one of federal funding and local control, and this shared responsibility for worker adjustment produces both strengths and weaknesses in the system. Local management of worker adjustment programs offers the potential for careful tailoring to local circumstances, a decided

benefit. On the other hand, there is also sometimes a clear need for national leadership, and in these cases, the U.S. Department of Labor should take more initiative. For example, federal leaders could make a significant contribution to worker adjustment by taking greater responsibility for identifying the transferability of skills from declining to growing occupations. A recent white paper by the American Electronics Association identifies severe unmet demand for skilled workers in high technology occupations like software design, programming and systems integration (AEA 1997). These demand occupations in many cases are not far out of reach of the skilled machinists and technical workers being displaced from the defense industry, especially if the resources for intensive skills upgrading are present. The gap between the socially optimal level of training and the level that firms provide to their workers is a well known concept in micro-economic theory. But federal officials cannot expect to adequately address this gap and its consequences unless they are willing to assume a more active and indeed directive role, first in identifying emerging labor market needs and second in targeting resources to help displaced workers (workers with obsolete but potentially quite valuable skills) to prepare for new positions that build on their existing capacities.

Lessons Learned

In part because of persistent problems in the EDWAA system, laid off defense workers' re-employment rates have been no higher than the re-employment rates of other displaced workers. Furthermore, while lower wages among those defense workers who did become re-employed might have been expected (since they have historically out-earned their civilian counterparts), typical wage declines of 20 to 40 percent suggest that many defense workers did not become re-employed in jobs that capitalized on their existing skills. Based on assessments of displaced defense worker assistance in several U.S. regions, and on information from programs that have pioneered alternative strategies, we recommend the following:

- ***Build more capacity for one-on-one counseling and strategy at the local level.***

Displaced defense employees would have been better served if local agencies had done more one-on-one work with both workers and employers. An appropriate intervention involves profiling workers' skills, examining their transferability, discussing how to frame or represent skillsets in a way that outside employers could understand, and providing workers with enough labor market data to weigh the merits of immediate out-placement, short-term skills upgrading and wholesale retraining or education. It also entails combining aggregate data with in-depth information collected from employers to gain a comprehensive understanding of the labor market – where jobs are available, what skills employers need, and what training organizations employers trust. Many defense workers have "enormous technical knowledge and adaptability in avionics, electronics, telecommunications, systems integration and production planning that are easily convertible" (Kiefer, 1990). DOL should ensure that wherever possible, JTPA EDWAA service providers help workers (engineering workers and production workers alike) attempt to translate this knowledge into a asset valued by prospective employers. [16]

- ***Identify growth occupations suitable for displaced manufacturing workers at a national level.***

Research at the federal level about the transferability of skills -- for example, from traditional manufacturing industry occupations into more high-tech manufacturing, or into telecommunications and information industry jobs, is crucial. Government-funded initiatives such as the National Skill Standards Board, sponsor of two dozen pilot projects, have overseen the development of skills certification protocols for advanced manufacturing. These should be

[16] While aggregate estimates of future labor demand show that few new technical and precision manufacturing jobs are being created, evidence from Connecticut suggests that openings do exist (in part because an aging workforce is beginning to retire), and that these jobs are within the reach of displaced defense workers if they can upgrade or adapt their skills.

institutionalized in the JTPA EDWAA system to help workers and program administrators understand what elements of so-called "obsolete" skillsets can be salvaged and built upon.

- ***Fund better options for long-term retraining***

Where defense workers have few skills that can be transferred into growing sectors, the federal government should provide the resources necessary to undertake long-term retraining for new occupations. Displaced defense workers are sometimes reluctant to contemplate a wholesale change of occupation (Kodrzycki 1995). But as noted above, those who do wish to enter long retraining courses are limited both by a lack of training funds and by a lack of income support beyond the term of their UI. Especially in light of demand shortages such as those identified by the American Electronics Associaton, an effort to make more substantial career change resources available to displaced defense workers would benefit those workers, their families and their communities as well as the larger economy.

- ***Create linkages between worker re-employment policy and local economic development***

As part of its capacity-building responsibility DOL could also do much more to encourage collaboration between EDWAA service providers and local economic development agencies. JTPA-mandated Private Industry Councils (PICs) provide what links exist between training and economic development in each Service Delivery Area. But the level and quality of PIC involvement varies greatly from place to place, and as noted above, the connection is hard to forge. In cases of military base closure, the Pentagon's Office of Economic Adjustment mandates that local adjustment organizations bring together workforce development and economic development officials together at the highest levels, making a demand-side strategy to address displacement more likely (Office of Economic Adjustment 1996). No such strategy was employed in defense industry workers' case. DOL has recently begun to address this vital issue, including an initiative to

integrate workforce development with the Manufacturing Extension Partnership in the Department of Commerce (Holl 1998). Unfortunately, these efforts come too late to have an impact on many laid-off defense workers.

A wide divergence exists in states' capacity to mount creative and effective labor adjustment efforts. In the 1990s, areas which had had chronic experience with structural decline – such as Long Island and the New England states – possessed institutions that were prepared to deal with the challenges of defense industrial displacement. Other states with less mature industry, such as California and Texas, were relatively unequipped for deep defense cuts. Local capacity is clearly key to the success of EDWAA programs, and DOL could take a stronger, more active role as an agent of "technology transfer," best practices dissemination, monitoring and evaluation.

III. Encouraging "High Road" Restructuring: Firm-Targeted Efforts to Avert Defense Worker Dislocation

In the wake of military procurement cuts, the survival strategies of defense-specialized firms were various. Some firms closed their doors. Others restructured to become more competitive in a shrinking defense market or pared down their workforces and waited for defense orders to come back in. Another group used cash reserves to buy up other firms, some defense-specialized, others more diversified. Still others invested late Cold War earnings in internal expansion, finding alternative customers for their products, adapting products to commercial markets, or designing new products, often using technologies developed with defense R&D funds. Companies pursuing this third strategy, while not always creating new jobs, generally stabilized their sales and avoided layoffs (Oden 1998, Feldman 1996).

The extent of defense industrial workers' dislocation, as well as their prospects for future employment, have depended on individual firms' strategies for continued competitiveness

during the draw-down. Some federally sponsored defense adjustment efforts have recognized that the availability of outside resources to support market diversification and manufacturing modernization can steer firms (especially small and medium-sized firms) toward survival strategies that retain jobs. This section describes initiatives sponsored by the Economic Development Administration (EDA) and the National Institutes of Standards and Technology (NIST) in the Department of Commerce, and innovative state-based agencies that helped stabilize employment in defense-reliant firms by helping them to build their commercial capacity. It also describes the closely related effort, sponsored by DOL, to provide incumbent workers with skills that served their employers' overall defense diversification and competitiveness goals. These efforts, implemented locally by dedicated staff in governmental, quasi-governmental and non-profit institutions, helped owners and employees pursue commercial markets and to implement new technologies and work systems at the firm level.

One lesson of the experiments detailed in this section is that federal-level enthusiasm for the so-called "dislocation aversion approach" must be matched locally by a crucial infrastructure of economic development agencies, business assistance corporations and revolving loan funds. These entities represent the enormous capacity that states and localities have developed over the last twenty years for managing and responding to economic change (Eisinger 1985). Such local capacity is most advanced in Massachusetts, New York, Michigan, and other states in which decades of deep structural unemployment, combined with strong labor movements, have forced experimentation and institution-building. For example, in Massachusetts, the Industrial Services Program (ISP), a state agency formed in the mid-1980s to help communities affected by plant closures, was already in place when defense spending cuts began to have an impact on small and medium-sized manufacturers in the state. The ISP had early warning of these impacts from one of

the local economic development organizations it sponsored, the Machine Action Project (MAP),[17] and was able to use this information proactively, providing several different forms of assistance to small defense-reliant firms statewide. ISP-sponsored assistance, funded through both the Massachusetts state budget and through federal grants, included workshops and seminars on defense conversion and assistance to help defense-reliant firms modernize their operations, as described below. The state's eventual establishment of a federally supported manufacturing extension program – funded in part through the Defense Reinvestment and Conversion Initiative (DRCI) – was grounded in these early efforts to assist defense manufacturers (Forrant and Flynn 1998).

Market Diversification, Internal Restructuring and Incumbent Worker Training

Initial federal funding to help defense-dependent firms pursue changes that would enable them to compete successfully in new markets often came from the Economic Development Administration in the Department of Commerce.[18] EDA focused on the economic health of particular places, providing resources to shore up existing businesses and incubate new ones in areas hard hit by defense cuts. Many communities receiving EDA grants pursued economic development strategies not involving defense firms. Some EDA efforts, however, included programs that directly assisted defense-reliant firms in restructuring their operations and/or finding commercial markets for their products (**Table 11**).

[17] MAP was an economic development consortium charged with coordinating industry-focused training and technical assistance to the hundreds of workers and firm owners in western Massachusetts' struggling metalworking industry (see Forrant and Flynn, 1998).

[18] The Pentagon's OEA, established in 1961 to work with communities adversely affected by defense program changes, was primarily concerned with the economic impact of military base closures rather than defense industry plants. A small portion of its expenditures, however, went to help states and localities respond to industry cuts, and localities sometimes included community-wide industrial diversification planning among their strategies.

Local economic development personnel used EDA funds to put the principles of "defense diversification" into practice. They organized seminars for defense sector managers on commercial markets that made sense in terms of their areas of expertise. They helped firms to conduct market research. They helped advanced technology firms that had received defense R&D funding apply for civilian R&D funding from the Advanced Technology Program (ATP) and the Small Business Innovation Research (SBIR) program. They acted as strategic planning and shop floor modernization consultants – Maine's Market Development Center, for example, introduced a number of metal-working firms to computer-based inventory control processes – and connected firms to people with specialized expertise. They assisted some firms to design plans to move into markets where they had not competed previously, and others (particularly firms that were already producing for both defense and commercial markets) to become generally more competitive.[19]

But many firms discovered that restructuring, especially if it is not to result in significant job loss, requires more than new processes and technologies. Administrators at the Massachusetts ISP learned from their experience with the EDA-funded Defense Diversification Project that defense firms, in addition to conducting strategic planning and market development, must also implement workforce changes to diversify successfully into the commercial sector, or even to compete more effectively in defense markets (**Table 12**). "We find," said an ISP report to EDA,

> that there is a need for services to firms regarding training of both management and employees for both strategic and operational objectives...Both workers and management need training in quality tools, group problem solving tools, conflict resolution, team building, meeting management, interpersonal communications skills and other areas. In addition a substantial percentage of the shop floor workforce in many companies needs adult basic education to substantially improve their literacy and mathematics skills in order

[19] The markets listed in Table 11 were appropriate for firms that had supplied relatively high-end components to the defense sector, but program administrators in some cases also worked with firms whose products were not "high-tech." For example, one participating firm in the Strategic Skills Program had supplied the military with furniture; with a loss of defense contracts, this firm reorganized to marketing its products to prison and library administrators.

to be trained in the tools of problem solving, teamwork and other critical areas of manufacturing modernization.[20]

Therefore, in an initiative enabling many local economic development agencies to build on their EDA-funded projects, the Department of Labor departed from its standard service model to award nine demonstration grants of $400,000 to $1 million to local projects that incorporated strategic planning and diversification efforts with employee training (**Tables 13 & 14**).[21] The primary factor distinguishing DOL's "dislocation aversion" demonstration projects from other economic and technical assistance aimed at defense firms was that participating companies fully committed themselves to incumbent worker training as a tool for furthering market diversification and other restructuring objectives (Department of Labor 1997).

In the Strategic Skills Project, for example, the Massachusetts Industrial Services Program selected firms that already had a strategic plan for diversification out of defense production. They then concentrated on facilitating intensive, customized training for incumbent employees consistent with the firms' overall strategy for competitiveness in the wake of the draw-down. Incumbent worker training provided through DOL grants was provided to both workers and managers and ranged from technical skills like statistical process control and inventory management to team building and leadership (sometimes called New Work System skills or High Performance Work Organization skills).

Local project administrators learned that incumbent worker training undertaken as part of a strategic modernization plan was most successful when it; 1) was jointly supported financially by

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[20] The Massachusetts agency that implemented the Defense Diversification Project and Strategic Skills Project is now part of the Massachusetts Center for Business, Work and Learning.

[21] DCA demonstration projects took place from early 1993 to the end of 1995. DOL financed several additional projects using the "dislocation aversion approach" using EDWAA discretionary funds.

DOL and internal firm funds; 2) involved a service mix balancing technical training to upgrade skills with team and leadership training focused on reorganizing the workplace; and 3) involved people from across a workplace -- management and production employees alike (DOL 1997, Teegarden 1997, Boxer 1998, Larson 1998, Richards 1998).

While many firms were able to maintain sales and keep employment stable as a result of pure technical and business assistance, evidence from the projects surveyed in Table 13 suggests that incumbent worker training is a crucial part of a defense diversification initiative with a job retention goal. "The primary lesson suggested by the dislocation aversion projects," said DOL's performance evaluation,

> is that by encouraging firms to invest in training incumbent workers as a readjustment strategy, the public sector can simultaneously help companies stabilize and increase their sales and help workers retain their jobs and enhance their skills (1997: 4-6).

A key component of this finding is that even if training provided to employees at risk for layoff does not result in the retention of their jobs, it can provide them with portable skills, thus making them more marketable to future employers. Involvement in the demonstration project has also enhanced the capacity of local training providers and economic development agencies and has helped to initiate collaborations between public sector actors who had previously not worked together.

Union-Management Partnerships for Modernization and Conversion

While the new production systems associated with defense industrial restructuring generally require fewer workers overall, the remaining workers who participate in these systems must often have skills and capacities that they were not called upon to have under the Cold War regime. "Lean" or "high-performance" manufacturing, codified in part through the study of Japanese auto

manufacturers, has been institutionalized in the U.S. through hundreds of regional quality networks, research initiatives such as the International Motor Vehicle Program and government-backed initiatives such as the Lean Aerospace Initiative and the Manufacturing Extension Partnership (MEP) in the Department of Commerce. Its attendant technologies and practices (including just-in-time inventory systems, institutionalized continuous improvement, and integrated product and process design) often require employees to work in teams, manufacture components in "cells," use computer-based scheduling and tracking systems and exercise greater decision-making power on the shop floor (Appelbaum and Batt 1992, Bertelli 1998a). The introduction of new forms of work organization and computer-based scheduling and production technologies in turn means that workers must develop problem-solving skills, teamwork skills, computer skills and capabilities on a broader range of machines.

As the Pentagon has increased pressure on defense contractors to produce at lower cost per unit, some defense industry unions have proactively confronted the challenge of industrial modernization. Initiatives undertaken by industry and DoD had historically focused on technology fixes and ways to reduce labor costs, without considering the possibilities held out by workplace reorganization and employee skills enhancement (Schlesinger 1984; Bertelli 1997). In the 1990s, efforts such as those studied in the DARPA-sponsored Agile High Performance Research Program have demonstrated that it is possible to achieve productivity gains, reduce costs and catalyze organizational cultural changes in the defense sector while retaining and developing a skilled workforce. A partnership between management and two unions[22] at the Lockheed Martin Government Electronics Systems introduced high performance work practices at a Moorestown, New Jersey radar systesms plant and contributed to a 64 percent increase in productivity, a 50

[22] The International Union of Electronics Workers and the International Federation of Professional and Technical Engineers.

percent decrease in cycle times and a 92 percent reduction in defects (Kaminski et al. 1996, Bertelli 1997). Because the defense sector's, unique, oligopolistic structure had chronically performed inefficiently in comparison to commercial industry, defense companies presented fertile opportunities for experimentation with high performance work practices, as several unions recognized (**Table 15**).[23]

Union-management collaborations to adapt defense products and technologies for the commercial sector also had some success. In the DOL-supported Hummer Project (see Table 14), a partnership between AM General Corporation and a United Auto Workers local led to production improvements that helped commercialize the military vehicle the Humvee for non-defense markets, averting a planned layoff of 400 workers in South Bend, Indiana. In Connecticut, employees at Chandler-Evans Control Systems (a division of Coltec Industries) underwent high-performance work systems training and reorganization associated with the design and marketing of a new fuel control pump. The partnership has not yet found a market for the product, but the training, workplace redesign and cultural transformation efforts, undertaken at all levels of the firm, have resulted in higher commercial sales of other products, the recall of laid-off workers, and a more productive relationship between managers and UAW local 405 (Sullivan 1997).[24] An effort between IAM&AW District Lodge 725 and H.R. Textron in Burbank, California to adapt servo-

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[23] The stake that union members have in defense production jobs traditionally made them a force of "supply-side resistance" to defense cuts. Skeptical of initiatives that would transfer federal resources out of defense industries, organized labor was not active until the early 1990s in efforts to persuade federal leaders to reinvest military dollars in civilian technology research and promotion. In the wake of U.S. procurement cuts, many in the labor movement looked to increased foreign military sales as a vehicle for job retention and growth in the defense sector. As union coverage in the defense industry has declined, labor leaders have become much more active in efforts to promote job creation for defense workers through vehicles other than continued military build-up.

[24] This initiative received funding from the Technology Reinvestment Project (TRP) and the State of Connecticut Department of Economic Development. At the local level, UAW Local 405 members were involved in the Call To Action, a New England-wide effort of unions and progressive organizations that advocated for worker-friendly federal and state defense industry policy.

mechanism technologies for commercial aerospace failed as a long-term labor-management partnership, but the training workers and managers received helped boost productivity in the pilot division by 20 percent, reversed a downward employment trend at the company, and enabled at-risk workers to gain skills that made them more employable in the commercial sector (Bertelli 1998, Kaminski et al. 1996).[25]

While the gains to be realized from labor-management partnerships in the defense sector are substantial, the defense industry is also an intensely complicated arena in which to experiment with high-performance workplace practices. 1990s restructuring in the industry has been dramatic and sudden, and as mentioned above, corporate decision-makers faced powerful incentives to merge, to exit the defense industry, or to consolidate and shed labor that outweighed the attraction of other routes to competitiveness. For most large contractors, the economic advantages of strategic workforce investments geared toward expansion into non-defense markets are fewer, particularly in the short term, than the advantages associated with mergers, radical downsizing, divestiture and arms exporting. This is especially true in light of the failure of the Clinton Administration's technology policy to achieve its initial goal of incubating and stimulating demand for high-tech non-defense products (see Section V).

The tribulations unions experienced in a restructuring defense industry did, however, present an occasion for labor leaders at the national level to refine their strategies and policies regarding labor-management partnerships.[26] The shortcomings of federal defense industry policy

[25] At HR Textron, the partnership foundered when its chief supporters in the management ranks were transferred to a different facility and replaced by new managers who favored a more traditional production approach. Union officials also experienced difficulty when their roles as partners came into conflict with their roles as contract negotiators. The experience underscores the fact that stable personnel relationships and an atmosphere of trust are a fundamental requirements for success in labor-management partnerships for workplace transformation (DOL 1997, Bertelli 1998, Kiefer 1998).

[26] The early 1990s also saw the reversal of many unions' long-standing policy of advocating for higher defense budgets. While unions, especially at the local level, had typically lobbied against the cancellation of weapons contracts

(the perverse incentives it put to contractors, the weak pull of inducements to diversify and convert) infuriated many union officials, but, in the words of the IAM&AW's Lou Kiefer, "it just helped us to focus more on the fact that if we were going to stop losing jobs we were going to have to work with partnerships" (1998). Kiefer, initially appointed as the IAM&AW's "defense conversion coordinator" in California, was soon transferred to the Washington, DC office as the "manufacturing conversion coordinator." He gives the defense downsizing experience much of the credit for galvanizing his union to institutionalize its High-Performance Work Organization program, which works to develop strategic labor-management partnerships in all industries.

Lessons Learned

The initiatives discussed in this section were experimental and often difficult to implement. They did not always succeed in saving or creating jobs. The value of many of their outcomes is impossible to measure -- for example, the worth to displaced workers of incumbent worker training they received before being laid off. Despite the measurement dilemma, public sector and union-management efforts aimed at averting defense worker dislocation demonstrate the significant potential of incumbent worker training strategies and labor-management collaboration in both the defense and the civilian manufacturing sectors. Based on our assessments of these programs, we recommend the following:

- ***Ensure a key role for employees, unions and incumbent worker training in workplace modernization initiatives***

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and opposed the efforts of disarmament and conversion advocates, the two groups found common cause during the 1990s in advocating for a post Cold War policy that diverted federal money from the defense infrastructure and into peacetime capital projects (the more labor-intensive the better). The alliance was a fragile one -- especially when it became obvious that the "peace dividend" would largely be used to reduce the deficit rather than to rebuild civilian infrastructure – and it fell apart in some cases as the agendas of the groups diverged. Nevertheless, some abiding relationships between the labor movement and progressive citizens organizations have formed, most notably the Call to Action effort that has joined labor unions, peace groups and progressive legislators in New England (Ward 1998).

In attempting to expand into non-defense markets, the small and mid-size companies assisted in the efforts profiled here discovered that their diversification strategies required them to re-engineer workplaces and to rely on their employees differently – in effect, to change their organizational cultures. This in turn required training for incumbent workers. Companies that received assistance meant to finance defense diversification often realized benefits and retained workers even if they continued to devote some or most of their production to military markets. Furthermore, workers who underwent training as part of these initiatives, gained valuable skills that they could take with them even if they were laid off by their defense sector employers.

- ***Carry knowledge from defense modernization initiatives into dealings with firms in all industries***

The experience of implementing defense dislocation aversion experiments helped many government actors and non-profit organizations build crucial capacity as technical assistance providers for industrial modernization and training-centered workplace redesign. It also helped labor unions pioneer new workplace-centered partnership strategies. These experiences, born from the crisis in the defense industry, should continue to inform local economic development and workforce development policies in general.[27]

- ***Make worker retention and training a goal of manufacturing modernization programs***

Some approaches to industrial competitiveness view a skilled and involved workforce, continual training, and close collaboration between management, engineering and the shop floor as integral parts of a cutting-edge company, but other approaches do not. Defense-bred modernization initiatives such as the Manufacturing Extension Partnership sometimes focus narrowly on

[27] The Department of Labor's new plan to expend funds on incumbent worker training is one example of how federal officials have acted on lessons learned from the Defense Conversion Adjustment demonstration. Many states, such as Arizona and Rhode Island, are also offering matching funds directly to companies to provide training to incumbent workers.

improving companies' short-term performance as indicated by sales and productivity growth. Going forward, publicly funded industrial modernization efforts – whether targeted at the defense sector, the civilian sector, or both – should put a premium on working with firms taking a "high road," training-intensive approaches to restructuring and high performance.

IV. "This isn't about jobs:" The Disappointing Outcomes of Technology Reinvestment

The Technology Reinvestment Project (TRP, administered by the Pentagon's Advanced Research Projects Agency (ARPA), was originally the centerpiece of the Clinton Administration's Defense Reinvestment and Conversion Initiative. By investing new resources in the development and deployment of high-tech products with both military and civilian applications, the Administration sought to create an incentive structure for defense firms that would encourage them to pursue commercial projects compatible with their military expertise. The hope of many in the Pentagon was that TRP would help defense firms to weather the post-Cold War draw-down while simultaneously speeding the delivery of leading-edge commercial technologies to the military. The hope of many in the labor movement was that as jobs were being lost in the defense industry, new jobs would be created in commercial industries stimulated by the new technology investments.

TRP funded a number of innovative commercial technology development and deployment projects, especially during its early years. But its budget was cut by the 103rd Congress, whose members charged that it was not defense-oriented enough.[28] Furthermore, between 1993 and 1997, (**Table 16**), the Defense Department gradually narrowed the program's mission to the "spin-on" of commercial technologies into military supply chains (Oden, Bischak and Evans-Klock 1996, Stowsky 1998, Bertelli 1997). TRP's successor program, the Dual-Use Applications Program, is

solely focused on adapting commercial technologies for military use (Bischak 1997). Considered amidst the other incentives in place for defense companies, government civilian R&D programs remain a weak inducement for defense executives to pursue market diversification as a competitiveness strategy. From the point of view of those who hoped TRP would remake the defense industrial base in a civilian image, then, TRP had limited success. But how did it do in terms of what many believed was a corollary goal – expanding employment opportunities for defense industry workers?

Of all the components of President Clinton's DRCI initiative, TRP appeared to offer the most to incumbent defense workers at risk of displacement. President Clinton proposed publicly that rather than emphasizing retraining and relocation assistance as most Department of Labor and Commerce initiatives did, TRP would invest federal R&D funds in military-to-commercial diversification efforts that would help to replace defense jobs with high-skilled, high-wage civilian work. TRP became identified in the public's mind as a program to re-employ skilled defense workers by helping their employers convert to commercial production. Privately, however, many Administration officials believed that defense contractors would fail in converting their high-overhead operations for commercial competition and that the program should be geared toward encouraging defense companies to partner with commercial ones to learn about low-cost production (Stowsky 1998). This skepticism, along with the fact that the administration of the program remained with the Department of Defense, ensured that TRP would be largely oriented toward esoteric technologies whose primary applications were in the military sector – a military sector that was rapidly shedding capacity.

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[28] This was ironic, considering a 1996 finding that over 80% of TRP projects thus far had had a strong defense focus (Oden, Bischak and Evans-Klock 1996).

Furthermore, it was evident from the TRP program guidelines that near-term job retention in defense-dependent firms was not a priority of program administrators. A number of TRP officials were hostile to organized labor's aim of achieving job retention and creation through the redirection of federal research and development priorities. They quickly made it clear that "this isn't about jobs:" the TRP was a defense technology program and any employment that resulted was purely incidental to the main objective of creating better, less expensive merchandise for the Pentagon (Crosby 1998). While labor leaders succeeded in adding a provision to TRP authorization legislation that allowed unions to apply for funding, they were unsuccessful in adding two other provisions – one that would have made job retention a criterion for evaluating TRP proposals and another that would have offered additional funds to companies that retained or added jobs (Stowsky 1998). Moreover, the high-growth-potential technologies that were supported under TRP had very long development lead times, with the result that most of the near-term jobs created through TRP funding were in research, not production (for example, the electric vehicle – see **Box 3**). While President Clinton had held up TRP as a key strategy for replacing lost production employment in the midst of defense industry downsizing, a lack of high-level support for this goal in TRP's administrative agency (DoD's ARPA) made its attainment virtually impossible.

The Demand Pull Issue

From the employment point of view, there is a deeper problem with the Administration's technology reinvestment policy: the fact that it has not been accompanied by a civilian "demand pull" strategy capable of approximating the role of the defense sector in the Cold War period. The commercial "spin-off" products spawned by the defense industry in the early Cold War era entailed not just the "technology push" that came from military-funded R&D but also the large-scale market

creation induced by defense and other government procurement policies (Oden, Bischak and Evans-Klock 1996). The commercial aircraft industry, for example, was incubated in the 1910s and 20s not only by federal research funds but also by government demand for aircraft – notably by the Air Mail Act of 1925, which greatly expanded demand for aircraft services in the government sector of postal delivery (Mingos 1968). Similarly, key early markets for semiconductors, computers and communications satellites -- now thriving commercial industries -- came from the government, mainly the Pentagon. A key reason that workers have not significantly benefited from defense economic adjustment policy in the 1990s is that a government "demand pull" strategy to match TRP's "technology investment push" has been absent.

As the Cold War ended, economists urged the federal government to leverage procurement resources, once aimed towards military superiority, toward new technologies and products in arenas like renewable energy, pollution prevention and clean-up, urban infrastructure, transportation and public telecommunications (Faux 1992, Markusen and Yudken 1992). If the decrease in the military procurement budget had been offset by increased government spending in other areas, the resulting "pull" might have helped to stimulate civilian sector demand for skilled engineering and production workers and thus offset some of the disruptions of defense layoffs.

For a short time, this strategy seemed to represent a win-win; Clinton's 1992 election campaign and early incumbency as President were full of pledges about federal investment in intelligent vehicles and advanced pollution abatement systems. And to a certain extent, government policies in the 1990s -- highway transportation initiatives like the Intermodal Surface Transportation Efficiency Act (ISTEA) and even welfare reform – have served as demand stimuli. Largely, however, those in the Administration who believe that deficit elimination is a pre-eminent priority have triumphed over those who advocated that the "peace dividend" be used as a demand

stimulus. The weakness of demand-side strategies virtually assured that the job creation potential of civilian technology investment would remain limited (see Box 3).[29]

Lessons Learned

Civilian technology initiatives, while boldly conceived, have been disappointing in many respects. First, they have not led to a significant demilitarization of federal research and development (Bischak 1997). More importantly for this paper, they have not fulfilled their original promise as engines of job generation. While it might be argued that the U.S. economy has generated hundreds of thousands of new jobs since 1993 without the help of a demand stimulus, it is also the case that much of the new employment is in low-paying service sectors and that many of the new jobs involve contingent or "non-standard" work arrangements. Furthermore, not only do pressing national infrastructure needs remain unmet (Faux 1996; Aschauer 1991), but fledgling industries such as renewable energy, pollution prevention and waste minimization remain much smaller than they might be in a more supportive federal demand environment (Pemberton and Renner 1998). Based on our evaluation of the still-significant potential for a successful non-defense demand pull (backed up by non-defense R&D) we recommend the following:

- ***Locate future defense reinvestment projects in the Departments of Commerce and Labor***

Vesting the Department of Defense with the administration of the highest-funded defense reinvestment initiative was politically expedient for the Clinton Administration. But it ensured from the start that efforts to shift the focus of R&D from military to civilian objectives would be frustrated in many respects (see Stowsky 1998). As labor unions' experience shows, it also ensured

[29] An estimated 20% ($280 million) of the $1.4 billion allocated to the Technology Reinvestment Project between 1993 and 1997 was invested in civilian technology projects (Oden, Bischak and Evans-Klock 1996).

that the issue of re-employment for defense industrial workers would be ignored and even denigrated by TRP administrators. A partnership between the Departments of Commerce and Labor would have been a better if more politically difficult choice as the entity to administer the TRP. The architects of any future efforts aiming to re-orient federal research and development capacity should consider an alternative administrative structure.

- ***Play an active role in the incubation of U.S. environmental industries***

With concerted regulatory and procurement strategies, federal agencies and Congress could perform the same role with respect to environmental industries in the 1990s as they performed in the development of the commercial aircraft industry in the 1920s, and in the computer and satellite communications industries during the Cold War. Regulation could help to stimulate private markets for environmental technologies. Procurement policy could create crucial initial markets for alternative-fuel vehicles, high-efficiency lighting systems and solar photovoltaic power. Only in the presence of such policies could industries like aircraft "reach scale" earlier in the century, and only with such policies can environmental industries begin creating significant numbers of remunerative jobs in the present day.

- ***Stimulate international demand for leading-edge U.S. commercial products***

A significant post-Cold War defense industry policy has been the promotion of U.S. arms exports. Yet the global arms market is shrinking, while markets for other leading-edge commercial products are more promising. For example, a recent report by the National Commission for Economic Conversion and Disarmament and the Institute for Policy Studies shows that the $400 billion world market for environmental technologies is expanding, but that the United States spends only 1/12 as much money in support of envirotech exports as it does promoting and financing international arms deals (Pemberton and Renner 1998). The export promotion policies of the United States should

reflect the waning importance of the arms industry and the growth potential of leading-edge commercial sectors where job creation is a real possibility.

Building Capacity for a Just Transition: Lessons from Military-Industrial Layoffs in the 1990s

Industrial restructuring, whether in steel, defense, telecommunications or any other industry, occurs within a policy climate created and maintained by public and private sector actors. If we view it narrowly as a firm-by-firm process of microeconomic adjustment to new demand conditions, we may neglect the important ways in which we might shape it – in which its outcomes might either achieve or fail to achieve the goals of full employment, living wages, and the productive re-use of human capital. This paper has reviewed the policy and programmatic conditions surrounding defense industry restructuring in the 1990s – a process that is unique in its direct implication of the federal government as the major customer, but which also has many things in common with restructuring in other industries. The lessons contained in the 1990s defense industry experience, therefore, are valuable both as defense firms continue to "rationalize" and as we anticipate change and reorganization in other sectors.

How, then, did public policies shape post-Cold War outcomes for defense industry workers? Despite a verbal commitment to a just transition, the federal officials responsible for defense economic adjustment in the 1990s enacted policies that stood in the way of that goal. Defense companies benefited from permissive merger policies and consolidation subsidies, but their workers were displaced by the tens of thousands. Federal policy supported foreign arms sales so vigorously that exports became the major "market diversification" strategy of many defense contractors – but the offset and co-production agreements companies made with their international

customers led to more worker displacement in the U.S.[30] While the Department of Defense's acquisition reform initiative might have rewarded productivity strategies compatible with job retention – strategies like worker training and labor-management partnerships – it instead promoted a brand of "lean production" that entailed industry downsizing and outsourcing. From defense officials' point of view, the alignment of defense industry practices with "best practices" in the commercial sector has been an effort to obtain weapons more cheaply for the U.S. military by cutting costs and shedding labor.

Technology reinvestment, the best-funded and most highly touted element of the Clinton Administration's defense adjustment initiative, conspicuously has not incorporated labor-related goals. The Pentagon, through the Technology Reinvestment Project, has been responsible for allocating a sizable chunk of post-Cold War defense reinvestment funding, but because defense officials dismiss the idea that skilled defense workers might be a resource on par with the defense-bred technologies the government is seeking to commercialize, they have restricted the scope of their efforts. Nor have promised job-generating investments in infrastructure and environmental technologies come to fruition. Following the failure of the Clinton infrastructure investment proposal early in 1993, the savings from defense cuts - the peace dividend - were principally devoted to deficit reduction. These policies too ensured that investors and defense company shareholders would benefit from post-Cold War restructuring as they did little to help most workers.

The evidence collected here shows, however, that defense economic adjustment has been an important vehicle for pioneering and experimenting with new types of displaced and incumbent

[30] The arms export strategy has also led to increased international instability and increased the probability of armed conflict. See Hartung 1995, Hartung 1998 and the Federation of American Scientists' *Arms Sales Monitor*.

worker assistance at the local and regional levels. Worker-centered and firm-centered programs financed by the Departments of Labor and Commerce have done impressive work during the 1990s, as has the more community-oriented Office of Economic Adjustment in the Pentagon. Several of these programs demonstrate the federal system of government at its best: strong, involved national agencies providing funds, clear guidelines and technical assistance to local administrative entities whose ability to deliver quality services relies on local knowledge of topics from labor market dynamics to the skills necessary for "state-of-the-art" performance in particular sectors. Projects like the Electric Boat Dislocated Worker Assistance Project in Groton/New London, CT and the Strategic Skills Project run by the Massachusetts Industrial Services Program have incorporated practices that should be stock elements of American displaced worker policy: intensive examination of existing skills combined with research on their potential transferability to other occupations and sectors; training for workers at risk of being laid off as well as displaced workers already on the job market; the genuine integration of worker training and placement efforts both with modernization strategies at the firm level and with economic development strategies at the regional level; and active efforts to continue building the capacity of local service providers.

Another lesson to be learned from this decade's defense transition is that public sector agencies and labor unions can address both firms' competitiveness and workers' well-being by strategically supporting firms' choices to undertake training-intensive modernization. A classic collective action dilemma often prevents companies from providing the socially optimal type and level of training to their workers.[31] Since it is risky to take a "high road" approach to industrial competitiveness – an approach entailing a skilled and involved workforce, continual training, and a

[31] "Unless the training employers provide is so narrow that it is only useful in their own firm, it will be marketable by the workers who receive it to other firms who do not pay for its provision; one firm's trainee may thus become another firm's asset, with the second firm advantaged by the benefits of training but not burdened by its costs" (Parker and Rogers 1998).

focus on quality – firms acting on their own often do not do so, and the result is a "low-wage, low-skill equilibrium" (Parker and Rogers 1998). As the Department of Labor's Defense Conversion Adjustment Demonstration projects show, public sector and labor union support for incumbent worker training and training-intensive (rather than technology-intensive) reorganization can exert a powerful influence on firms' decisions about how to restructure. In most industries, claims one researcher, firms can be equally profitable with "wildly different mixes of wages, skill, technology, training and basic management discipline" (Luria 1996:105). Incentive structures that encourage firms to reorganize in ways that both boost competitiveness and increase returns to labor should become a norm in economic development policy.

The experience of defense workers during the 1990s highlights some of the worst flaws of the systems designed to support firm-level change, workforce preparation, and displaced worker adjustment in the United States. It also highlights some exceptionally promising experiments that, if institutionalized and diffused, have the potential to address those flaws. It is to these experiments and their lessons that we should turn as we look ahead to future waves of industrial restructuring and worker displacement in the United States.

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Table 1: Defense reinvestment and conversion-related programs (less rescissions) and restructuring reimbursements to firms (millions of current dollars)

Fiscal Year	1993	1994	1995	1996	1997	Total
Department of Defense (DoD)						
Technology Reinvestment Project	472	397	220	195	85	1,369
Other Dual-Use Initiatives	381	1,227	1,536	1,237	1,030	5,410
Maritech (shipbuilding)	0	80	40	50	50	220
Military Personnel Assistance	756	596	985	1,093	0	3,430
Office of Economic Adjustment	80	39	39	61	53	272
Department of Energy (DOE)						
Office of Worker and Community Assistance	85	100	115	83	62	445
Department of Commerce (DOC)						
Economic Development Administration	80	80	95	90	90	435
National Institute for Standards and Technology (NIST)[a]	140	228	319	301	320	1,380
Department of Labor (DOL)						
Displaced Defense Worker Training[b]	75	24	20	20	20	159
Multi-Agency Programs						
Conversion-related High Technology Initiatives[c]	0	1,072	827	744	730	3,373
Restructuring Costs reimbursed						179[d]
Grand Total	**2,069**	**3,843**	**4,260**	**3,874**	**2,440**	**16,672**

Source of all figures except data on restructuring cost reimbursements: Bischak (1997). Source of data on restructuring cost reimbursements: U.S. General Accounting Office (1997b).

[a] Numbers for National Institute of Standards & Technology include Advanced Technology Program, Manufacturing Extension Partnership and in-house R&D.

[b] The National Economic Council in the White House estimated that about $178 million annually in general dislocated worker assistance funds (Job Training Partnership Act Title III) would go to defense workers, but subsequent experience failed to validate these estimates; about $20 million per year seems more reasonable based on actual grants made from the Title III National Reserve Account for 1994-96.

[c] Includes all new money over 1993 levels allocated for DOE CRADAs (Cooperative Research and Development Agreements), NASA Aeronautics Initiative, Department of Transportation Intelligent Vehicle Highway System, Multi-Agency High Performance Computing, Department of Commerce Information Highways and Environmental Protection Agency Environmental Technology.

[d] The U.S. General Accounting Office reports that DoD had reimbursed firms for $179.2 million in restructuring costs through September 1996.

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Table 2: Sales, Employment and Military Share of Revenues of Selected Prime Defense Contractors, 1989-97

	Sales 1997 (millions of real 1992 $)	Employees 1997	% Change in real sales 1989-97	%Change in Employment 1989-97	Defense/ Total Sales 1989	Defense/ Total Sales 1997
Boeing[a]	$41,561	n.a.	11%	n.a.	28%	30%
Lockheed Martin[b]	25,408	173,000	35%	8%	80%	66%
United Technologies	22,426	180,100	3%	-11%	24%	13%
Raytheon Co.[c]	12,432	119,150	-27%	-21%	54%	46%
Textron	9,568	64,000	15%	10%	23%	10%
Northrop Grumman	8,348	52,000	-15%	-26%	81%	89%
Unisys Corp.	6,022	32,600	-47%	-60%	20%	3%
Litton Industries	3,789	31,500	-32%	-38%	60%	70%
General Dynamics	3,686	29,000	-67%	-72%	90%	90%

Sources: Compiled by Laura Powers from Oden (1998), *Defense News Top 100* (1998); Securities and Exchange Commission EDGAR database.

[a] Figures for Boeing reflect the combination of its assets and operations with those of McDonnell Douglas.

[b] Figures for Lockheed Martin reflect the combination of its assets and operations with those of Martin Marietta and Loral.

[c] Figures for Raytheon reflect the combination of its assets and operations with those of Texas Instruments. In December, 1997, Raytheon announced its acquisition of the defense electronics division of the Hughes Corporation. Job cuts are projected at 15,000 [source], and defense revenues are expected to nearly double in absolute terms, also rising as a %age of total revenues (*Defense News* 1998).

Table 3: Employment in Defense-Specialized Manufacturing Industries 1987-95

Industry and SIC Code	Employment 1995 (in thousands)	% Change in total employment 1987-95	% Change in defense-related employment 1987-96
Shipbuilding and Repair (3731)	100.3	-15%	-44%
Aircraft, engines and parts (3720)	464.0	-25%	-54%
Guided missiles and space vehicles (3760)	88.4	-55%	-54%
Search and navigation equipment (3812)	197.4	n.a.	-61%

Sources: Compiled by Laura Powers from County Business Patterns (U.S. Census Bureau), Thomson (1998).

* figure is for defense-related employment in the aerospace industry

Table 4: Output and Employment in Defense-Specialized Manufacturing Industries 1989-95

Industry and SIC Code	Value of Shipments 1995 (billions of 1992 $)	% Change in real value of shipments 1989-95	% Change in employment 1989-95
Aircraft, engines and parts (3720)	77.94	-15%	-24%
Search and navigation equipment (3812)	27.36	-33%	-42%
Guided missiles and space vehicles (3760)	17.35	-46%	-60%
Shipbuilding and Repair (3731)	8.91	-15%	-18%

Sources: Compiled by Laura Powers from Manufacturing Industry Shipments (U.S. Department of Commerce, Bureau of Economic Analysis, Industry Economics Division); County Business Patterns (U.S. Census Bureau).

Table 5: Estimated defense-related employment in selected industries 1977-96 (thousands of jobs)

	1977	1987	1996	% change 1987-96	% change 1977-96
Manufacturing					
Fabricated structural metal products	22	23	15	-36%	-32%
Ammunition & ordnance	26	53	26	-51%	0%
Aerospace	258	492	228	-54%	-12%
Communications equipment	31	58	27	-53%	-13%
Computer and office equipment	23	52	12	-76%	-46%
Search and navigation equipment	79	197	77	-61%	-3%
Ship building and repairing	78	87	56	-36%	-28%
Measuring and Controlling devices	29	34	19	-44%	-33%
Services					
Personnel supply services	7	125	145	16%	2092%
Computer and data processing services	8	58	50	-13%	545%
Engineering and architectural services	11	102	68	-34%	526%
Acounting, auditing and services n.e.c.	11	62	49	-21%	333%
Management and public relations	12	86	71	-17%	490%
Research and testing services	61	151	106	-30%	74%

Source: Thomson 1998 (Bureau of Labor Statistics)

- • union coverage is for computers and related equipment
- •• union coverage is for aircraft and parts

Table 6: Annual growth rates for major defense stocks, S&P 500 Index, and S&P Aerospace/Defense Index 1989-97

Stock	Compound annual price growth 1989-97*
S&P 500	16
S&P Aerospace/Defense Index	19
Lockheed Martin	14**
Raytheon	17
Boeing	14
Northrop Grumman	31
General Dynamics	29

Source: Bloomberg News Service

*Assumes reinvestment of dividends.
** Growth rate for 12/29/95-12/31/97. All other growth rates calculated for the period 12/29/89-12/31/97

Table 7: Post-Cold War Changes in Defense Industrial Policy and the Defense Labor Market Environment

Federal Defense Industry Policy	Defense Labor Market Environment
➢ Pentagon-encouraged consolidations and mergers have reduced the number of major defense contractors from 15 to 4.	➢ Goods-producing industries have shed labor as a result of consolidation and the institution of new production technologies and lean business practices; defense-related services industries have experienced a sharp relative increase.
➢ Acquisition reform efforts have belatedly introduced the discipline of "lean production" to the defense industry.	➢ Skill requirements in defense manufacturing are changing as companies introduce computer-driven production technology and adopt new systems of job classification and work organization.
➢ Federal promotion and financing of arms exports has increased the U.S. share of the world arms market - a by-product of this is the negotiation of offset agreements that transfer weapons production to other parts of the world.	➢ Firms' geographic preferences have changed, shifting a greater %age of defense-related employment to the southern and western parts of the U.S. and increasingly (because of offset agreements) to other countries.
➢ Federally sponsored research and development continues to be chiefly focused on military objectives, limiting the potential to jump-start job creation in cutting edge civilian sectors.	➢ Union representation in the defense industry has declined, and reliance on labor market intermediaries such as temporary help agencies has grown

Table 8: National Statistics for JTPA Title III, Economically Dislocated Worker Adjustment Act

	FY1992	FY1993	FY1994	FY1995
Number of participants completing program	182,730	164,850	192,800	266,610
Entered employment rate	69%	68%	71%	72%
Employment rate at follow-up	69%	69%	73%	74%
Average hourly wage at dislocation	$10.20	$7.90	$11.90	$11.80
Average hourly wage at follow-up	$9.30	$9.20	$10.30	$10.70
Cost per participant entering employment	$4,370	$4,850	$6,950	$5,620
Average weeks of participation	32	39	34	34

Source: U.S. Department of Labor, Employment and Training Administration Office of Worker Retraining and Adjustment Programs

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Table 9: Defense Worker Re-employment Outcomes

	% re-employed	% recalled	% in retraining	Avg. drop in wages	% re-employed in production occupations
Mueller and Gray 1994 – laid off workers from Unisys Corporation, Flemington, NJ n=132	26.7% (after one year)	0	50% (after one year)	46%	12.9%
Mueller and Gray 1994 – laid off workers from McDonnell Douglas Corporation, St. Louis, MO	45% (after one year)	14%	n.a.	44%	n.a.
Kodrzycki 1995 – displaced defense workers from ME, MA and VT n=5001	49% (after 18 months)	n.a.	30%** (after 18 months)	20-40% (modal)	42.5%***
IAM&AW 1996 – union aerospace workers* from Lockheed Martin, Marietta, GA and Boeing, Seattle, WA n=715	64.9%	23%	n.a.	20%	41.9%

* an average 53% of aerospace industry revenues came from military sales between 1991-95 (Aerospace Industries Association 1998)

** unemployed or in training.

*** Massachusetts workers only

Table 10: Occupations with largest predicted job gains in defense-specialized regions in the 1990s

Region	Los Angeles	St. Louis	Long Island
Occupations	Salesperson-retail	Annual growth rates:	Retail sales clerk
	General office clerk		Secretary
	Security guard	Services: 1.5%	Home health aide
	Waiter/waitress	Professions: 1.2%	General office clerk
	Instructional aid	Managerial: 1.05%	Registered nurse
	Food prep. Worker	Marketing/sales: .98%	Sales supervisor
	Truck driver, light	Clerical/admin. Support: .38%	Receptionist
	Accountant		Clerical supervisor
	Cashier	Precision production, craft and repair: .03%	Nursing aide/orderly
	General Manager		Sales representative
	Shipping/receiving clerk		
	Receptionist		
	Lawyer		
	Systems analyst		
	Registered nurse		
	(California Employment Development Department, 1992-99 projections)	(Missouri Division of Employment Security, projections for 2000)	(New York State Department of Labor, 1993-97 outlook)

Table 11: Major Markets for Diversification

Industry/Product Cluster	Annual Size (billions of $)	Growth Prospects
Telecommunications	50 +	Strong
Commercial Space/ Satellite	10 +	Strong
Commercial aerospace	10 +	Moderate
Fiber-Optics Systems	10 +	Strong
Automotive Electronics	10 +	Moderate
Medical Diagnostic Equipment/Imaging	10 +	Strong
Government Information Systems	5 +	Moderate
Environmental Sensors	5 +	Moderate
Air Traffic Control Systems	5 +	Moderate
Commercial shipbuilding	5 +	Weak
Mass Transportation/Command and Control Equip.	3 +	Weak
Alternative Transportation Vehicles	1 +	Moderate

Source: Oden (1998).

Table 12: Findings of the Defense Diversification Project (Massachusetts Industrial Services Program)

Transformations required to move from defense to commercial market	How government helps accelerate diversification
➢ Acquisition of new expertise in fields such as marketing, strategic planning and commercial pricing	➢ "The prospect of a seed grant focuses the energies of a company on diversification"
➢ Transformation of the "culture" of the business from one of being reactive to government procurements to being aggressively competitive.	➢ "The grant monies enable projects to move forward that otherwise might not be tackled for an unforeseeable [amount of] time...earlier action can provide a strong strategic advantage vis a vis the competition..."
➢ Transformation of the culture of the workplace to enable workers to become more proactively involved in decisions affecting their own work.	➢ "The government's presence helps the company focus on strategic planning...Our project was designed to help the companies focus on actions that would have a positive impact on sales or profits in the near future or that would position them to take actions necessary to achieve longer term objectives"

Source: State of Massachusetts Center for Business Work and Learning (1996)

Table 13: Selected Defense Economic Adjustment Programs Targeted at Firms

Local Implementer(s)	Program(s)	Federal Sponsor(s)	Activities	Accomplishments
Arizona Council for Economic Conversion; Pima County Community Services Department	a) Arizona State Defense Adjustment Project b) Demonstration Project for the Conversion of Sargent Controls and Aerospace Company	a) Department of Defense Office of Economic Adjustment (OEA) b) Department of Labor (DCA)	Sponsored "technology exchange forum" for restructuring companies; helped client companies identify new markets, adapt production lines, become ISO 9000 certified, integrate computer technologies; brokered and helped finance workforce training	Almost all client companies have changed the way they do business; net new jobs created; Sargent Controls undertook commercialization plan and is now 50% commercial (largely through an acquisition) ACEC's work with client firms is ongoing
Connecticut Department of Economic Development	Connecticut Defense Information Services Network	Economic Development Administration (Dept. of Commerce)	Conducted workshops for small defense firms on high-tech markets where climate was similar to that of defense industry – concentrated on other government projects such as Intelligent Vehicle Highway System and NASA –brokered firm connections "experts" (professional or pro bono business consultants)	Connected 100 firms to expert consulting services – no statistics, but through consulting process, several small companies built capacity to get big supplier contracts they had not been able to get before – Success in linking firms with non-defense government projects – 60 of 100 CT applications to the Technology Reinvestment Project (TRP) succeeded

Local Implementer(s)	Program(s)	Federal Sponsor(s)	Activities	Accomplishments
State of Massachusetts Center for Business Work and Learning (formerly MA Industrial Services Program); public and private sector training providers	a) Massachusetts Defense Diversification Project	a) Economic Development Administration (Dept. of Commerce), DoD Office of Economic Adjustment	Served as broker for and funder of diversification-related technical assistance and training to 10 companies	Jobs retained: 200
	b) Massachusetts Strategic Skills Program	b) Department of Labor (DCA)	Trained workers in 20 firms in high-performance workplace skills and occupational skills needed to achieve diversification and conversion objectives	All but four firms completed planned training; several reported performance improvements; majority avoided layoffs and experienced stable or increasing sales during training period
	c) Textron Suppliers Project	c) Department of Labor (Title III)	Developed customized training plans and arranged incumbent worker training for 15 suppliers of major defense contractor	1201 participants received training [I will get the final report from this project]
New York State Department of Economic Development (Defense Diversification Program); New York State Department of Labor; Long Island Regional Education Center	Long Island Defense Diversification Project	Economic Development Administration (Dept. of Commerce) Department of Labor (DCA)	Helped 12 firms identify prospective commercial markets and linked them with state-level financial and technical resources to help them modernize their business practices – provided total quality management training for production and managerial workers	Jobs created: 243 Jobs retained: 458 Avg. of 60% of workers attained measurable competencies in critical skills areas Six companies developed new commercial products; five found new customers for existing or modified products; three introduced new technologies

Local Implementer(s)	Program(s)	Federal Sponsor(s)	Activities	Accomplishments
St. Louis County Economic Council; Economic Adjustment and Diversification Committee; private sector business consultants	St. Louis Management Assistance and Technology Transfer Program	Department of Labor (DCA)	Consulted on self-assessment process with 10 firms, providing them with assistance formulating strategic plans for diversifying into commercial markets –Conducted customized training with 16 firms	Some firms proceeded to develop and market commercial products, but performance was hard to assess because benchmarks were not established in advance
Work and Technology Institute; 7 unions; regional training institutions	Agile High Performance Research Program (nationwide)	Defense Advance Research Projects Agency (DARPA)	Implemented and evaluated the use of formal problem-solving processes, continuous improvement processes, work teams, gain-sharing, multi-skilling and performance benchmarking in three defense firms	All three participating plants achieved productivity and scrap reduction gains; employment outcomes unknown [?]; workers at two plants received substantially higher levels of training than they had before the project began

Sources: Compiled by Laura Powers from Bertelli (1997), Economic Development Administration, U.S. Department of Commerce (1997); Oden et alvans-(1993); Oden, Mueller and Goldberg (1994), U.S. Department of Labor (1997); Interviews with state-level economic development personnel.

Table 14: Training Completed by Incumbent Employees of Participating Firms, Department of Labor Defense Conversion Adjustment Demonstration

	Number of participating firms	Occupational Training*	Team and Leadership Training*
Long Island Defense Diversification Project	12	Statistical process control; technical training customized to employer needs	Team-based training for labor-management committees; management development training; communications skills
Massachusetts Strategic Skills Project	20	Cross-training to increase worker flexibility; just-in-time inventory methods; statistical process control; ISO 9000 specifications	Problem-solving and communications skills
Sargent Controls Project (Pima County, AZ)	11	Marketing; manufacturing-based cost accounting; personal computer skills, business grammar, customer service; financial management; hydraulics; material control; project management	Interpersonal communication; leadership
Hummer Project (South Bend, IN)	9 (prime contractor and 8 suppliers)		Communication and teamwork; problem-solving; joint decision-making associated with development of commercial product line

* all training was customized to individual firms' needs in concert with their diversification and competitiveness objectives

Source: Compiled by Laura Powers from Department of Labor (1997) and interviews with state-level economic development personnel.

Table 15: One Union's View of the the Post-Cold War Adjustment Challenge

	Defense Contractor	Global Competitor
Design	Driven by Pentagon-required hardware design and performance	Driven to process quality, competitive-entry production
Nature of Response	"Big leap" improvements in generational cycles	Innovative, rapid incremental improvements
Product Cycle	Measured in decades	Measured in months
Priorities	Design product for zero defects, A+ performance, long shelf life	Perfect the process for lowest cost, highest-quality production
Production	Teamed for design of single copy; duplicate at relatively slow rate	Teamed for prototype – produce components in batches
Linkage of R&D to production	R&D separately contracted	Manage integration between R&D, production and customer response
Technology sharing	May require sharing know-how with second-source provider	Success often based on market penetration and technological edge
Systems	Total Quality Management; Teaming	High Performance Work
Rewards	Gain-sharing; bonus pay; high profits; boom and bust cycles	Market share; sustained profit and jobs; quality wages

Source: International Association of Machinists and Aerospace Workers

Table 16: Technology Reinvestment Project Budget 1993-97

Fiscal Year	Amount (millions of 1997 $)
1993	$472
1994	$397
1995	$220
1996	$195
1997	$85*
TOTAL	$1,369

* 1997 funding is for DoD Dual-Use Applications Program

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Source: Bischak, (1997).

Box 1:
Should Defense Workers Have Received Targeted Services?

From the early 1990s, policy analysts disagreed on the question of whether defense industrial workers would benefit from targeted adjustment services. Those who advocated a targeted program argued that defense worker displacement had been sudden and geographically concentrated, and that defense workers had extensive but often specialized skills that would not easily transfer into non-military sectors. Some also argued that the Pentagon had a special responsibility to defense industrial workers and should provide them with the substantial retraining benefits and income support that it was offering at the time both to downsized military personnel and to DoD civilian employees who worked in the Pentagon and at arsenals, depots and military bases.* Others downplayed the role of government in the adjustment process and suggested that targeted assistance was unnecessary. The Congressional Budget Office, for example, concluded that the "best solution to defense conversion" was strong growth in the economy (1993: 31).

In the end, dislocated defense industry workers received much less government assistance than their counterparts in the post-Cold War military and DoD civilian sectors; the services they had at their disposal were roughly comparable to those available to mainstream dislocated workers, and so were their re-employment outcomes: some adjusted easily, but a sizable number had extended spells of re-employment and took large pay reductions. Some analysts cite this comparability of outcomes as evidence that targeted services were unwarranted (Schoeni et al 1996). We read them as testimony that all displaced manufacturing workers, whether from the defense industry or other goods-producing sectors, could significantly benefit from individualized efforts to assess their skills and link them – via long-term training and income support if necessary—with employment that capitalizes on those skills. Evidence from the Electric Boat Dislocated Worker Assistance Program suggests not only that this type of investment is worthwhile for participants but that it can help to address skill shortages in a regional economy.

* Support for displaced military and DoD personnel included extensive placement assistance, priority consideration for jobs with other federal agencies, re-location assistance and assistance with home sales. An initiative called the Service Members Occupational and Conversion Training Act (SMOCTA) provided up to $10,000 to employers who hired displaced veterans, financing their wages during a 6 to 18-month on-the-job training period (Office of Economic Adjustment 1996).

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Box 2:
The Electric Boat Dislocated Worker Assistance Program

"In 1993, the Work and Technology Institute began working with the Metal Trades Council at Electric Boat, with regional community activists, and finally with managers on responses to large layoffs, which have reduced the production workforce from more than 8,000 to fewer than 2,000 since 1989. The primary response during that time had been a series of studies funded by the Office of Economic Adjustment (OEA) in the Department of Defense and grants totaling several million dollars provided by Economic Development Administration.... These efforts had led to some minor infrastructure improvements and the creation of an entity called the Connecticut Regional Economic Development Authority (CRED) which was designed to coordinate and host a set of finance and manufacturing extension services mainly to attract new employers to the region and to spur entrepreneurship. Increasingly, these efforts had targeted two sectors suggested by an OEA-funded Arthur D. Little study – health care services and tourism.

After requests for new discussion around conversion or diversification attempts were rejected by General Dynamics management, a project team began considering mechanisms to improve EB's dislocated worker program. Preliminary research revealed that, for the first four rounds of lay-offs, General Dynamics had been weak, by industry standards, in supporting outplacement, and that the program had been largely ineffective. The largest single re-employer of dislocated EB workers was Foxwoods Casino, recently built on the nearby Mashantucket Pequot reservation. Because these jobs, and most other replacement jobs, did not meet previous wage levels or utilize skills developed in the shipyard, an effort was made to create a program that would 1) survey regional employer needs, both in the area of new job openings, and more broadly on trends in their firms, 2) modify the outplacement program to create skill portfolios that might better enable workers on notice to evaluate how their skills matched the regional labor market, 3) use this information to match workers on notice of layoff with any job openings identified, and 4) see if the foundation could be formed for an ongoing dialogue among employers and unions from regional plants on issues of regional workforce development...."

Domenick Bertelli 1998. Evaluating Employment Trends and Skill Needs in Connecticut Aerospace: Results of a Survey and Discussion of Action Steps Washington, DC: Work and Technology Institute.

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Box 3:
Two Workforce Conversion Initiatives That Faltered for Lack of Demand Pull

The International Association of Machinists and Aerospace Workers (IAM) is one of the founding members of CALSTART, a consortium of southern California firms working together to develop the electronic and alternative fuel vehicles industry. In late 1992, IAM's Lodge 727 in Burbank, California received a Department of Labor Defense Conversion Adjustment demonstration grant to train displaced aerospace workers for jobs with start-up firms in the advanced transportation industry. IAM had worked with the CEO of a small advanced transportation start-up to develop a matrix linking skills likely to be needed in the design and construction of electric vehicle prototypes with competencies possessed by aerospace industry technicians, machinists and operators. For example, there was projected to be a highly concentrated need for developmental and fabrication mechanics in the construction of chassis, body structures, battery assemblies, sensors and airbag systems.

Electric vehicle manufacturers were relying, however, on a market that was projected to develop in response to new federal emissions standards. When implementation of the regulations was delayed, the market for electric vehicles in California floundered, and so did the start-up companies that IAM had hoped would hire its workers. An active "demand pull" strategy – more vigorous enforcement of clean air standards or federal subsidies to underwrite initial electric vehicle purchases by households and businesses – could have created a vital market for an environmentally sound technology and helped to re-deploy aerospace workers in jobs that drew on their existing skills.

Sources: Department of Labor (1997), Kiefer (1998).

In Connecticut, community organizations, unions, and local legislators united to urge a supportive policy climate for the development and marketing of gas turbine electric generating systems, a product they believed had near-term potential to shore up defense job losses in the state. Gas turbine engines, which power jet aircraft and whose early development was almost entirely financed by the Department of Defense, had been adapted in the 1970s and 80s for use as small stationary electric power generators, and efficiency advances in the early 1990s made them even more suitable for this purpose. Gas turbine electric generators, which produce electrical energy more efficiently and with less pollution than steam turbines, were a technology particularly ripe for export to countries which were just beginning to develop power systems. Advocates with the Naugatuck Valley project and others pressed companies including Textron Lycoming of Stratford and United Technologies of Hartford to invest in the development of these defense-bred technologies with commercial potential.

Advocates also wanted the State of Connecticut to provide incentives for gas turbine engine development and innovation – and the state did make a loan to United Technologies Corporation through its Defense Diversification Fund. But a second goal of the Connecticut legislature's Gas Turbine Task Force – to secure federal level support for the development, marketing and export of advanced gas turbines – was never realized. It might be argued that a world market for gas turbine generators would have developed without subsidy – but the same might be said of the world market for weapons, in which the U.S. government actively participates by providing several billion dollars to in grants and subsidized loans to buyer countries on an annual basis.Gas turbine technology continues to advance, and has created a modest number of new jobs in Connecticut and other states. The technology has a future with or without government intervention. But Defense and Commerce officials might have accelerated the new industry and helped spur the re-deployment of skilled defense workers into appropriate new jobs had they taken the same interest in promoting environmental technology exports that they take in promoting arms sales.

Sources: Weisman (1990), Gordes (1991), Bean (1997), Gordes (1997) Hartung (1998)

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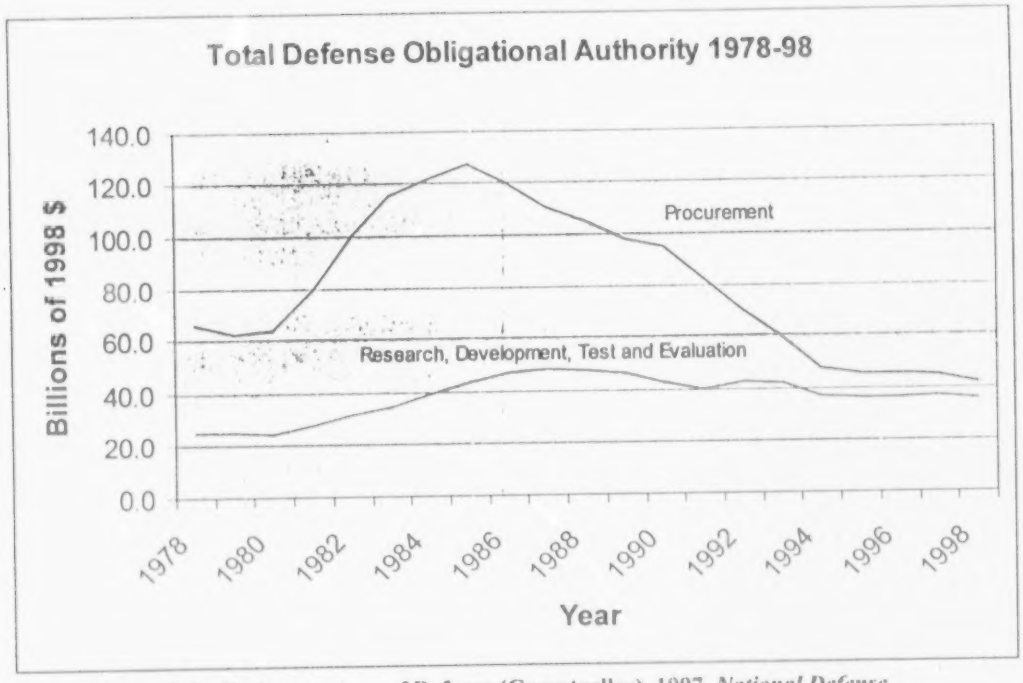
Figure 1



Source: Office of the Undersecretary of Defense (Comptroller), 1997, *National Defense Budget Estimates for 1998.*

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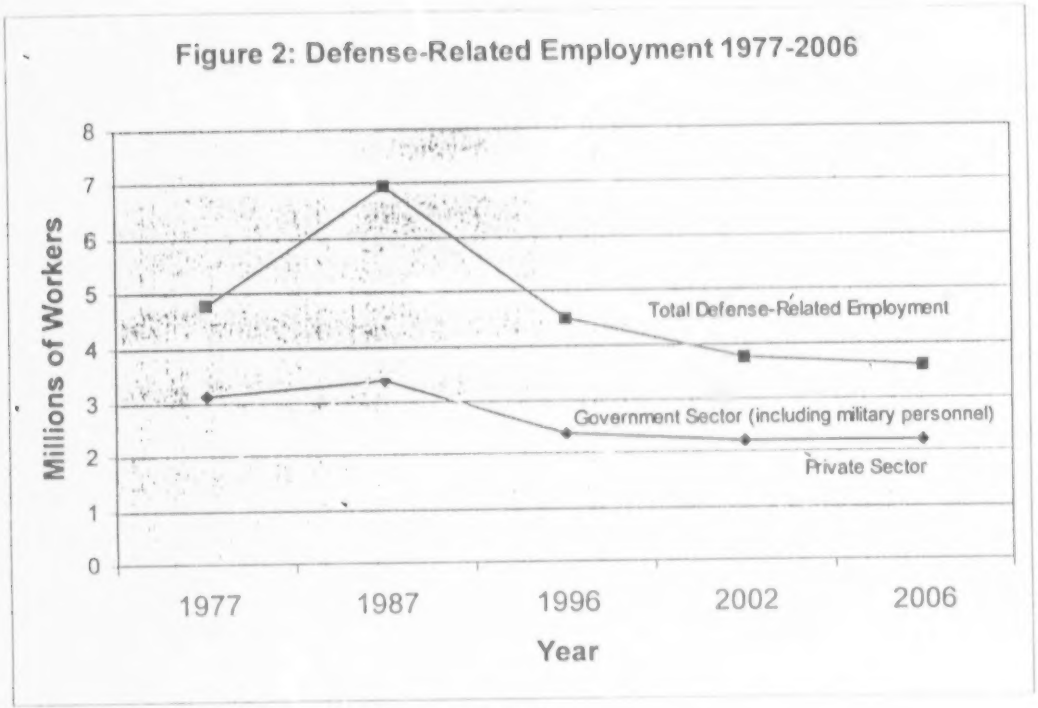
Figure 2



Source: Thomson 1998 (Bureau of Labor Statistics)

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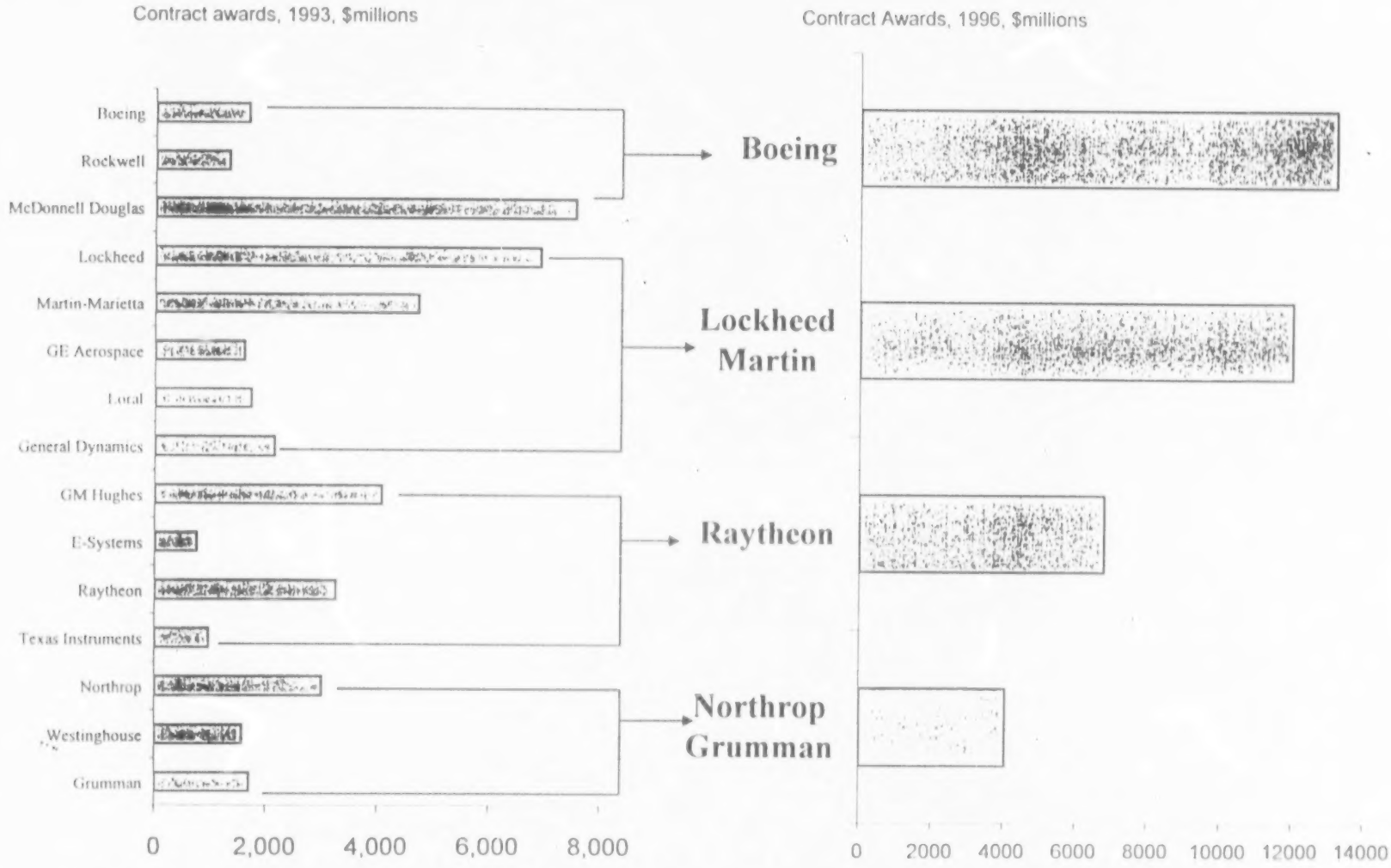
Figure 3: U.S. Defense Merger in the 1990s



Source: All data are from the Department of Defense publication (P01), *100 Companies Receiving the Largest Dollar Volume of Prime Contract Awards form the Fiscal Year of 1993 and 1996.*

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